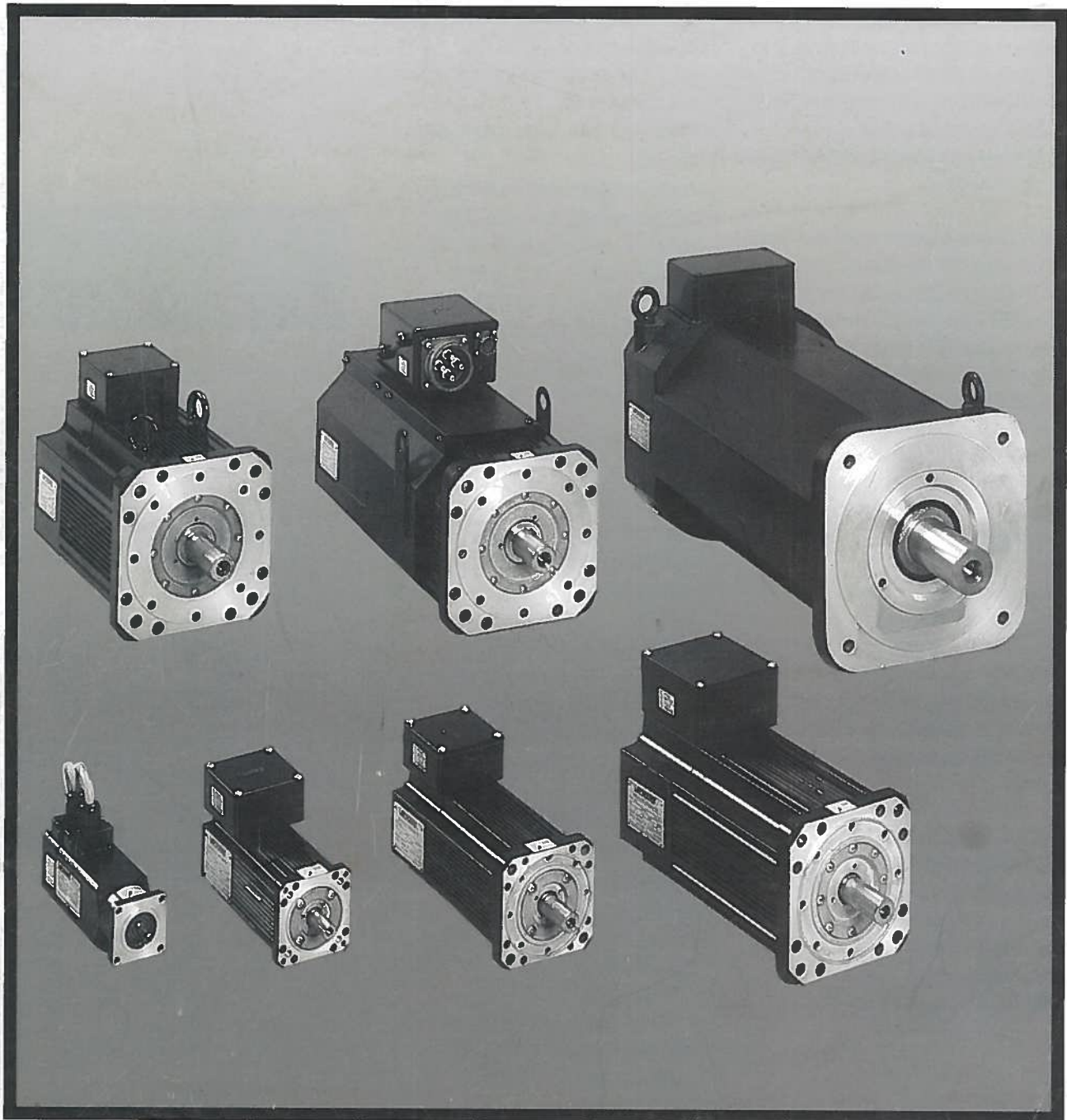


**VICKERS**

**FASTACT T SERIES  
BRUSHLESS SERVOMOTORS**



## DESCRIPTION

Series T FASTACT servomotors are Vickers' solution to the ever increasing demands of accurate axis control in industrial automation applications. FAS T servomotors provide high dynamic performance characteristics coupled with automated production techniques, to offer the customer established brushless motor performance advantages and traditional dc servo system economy.

The FAS T family is subdivided into six frame sizes and is composed of 22 models. Torque ratings range from 0.3 to 260 Nm (2.66 to 2300 lb in) at  $\Delta\theta_{win} = 65K$  [0.4 to 320 Nm (3.5 to 2832 lb in) at  $\Delta\theta_{win} = 110K$ ] and there are two speed ratings for each model.

FAS T servomotors are available in "M" and "V" versions. Type "M" windings are designed for use with 230 V<sub>AC</sub> drives; namely Vickers DBM03 and DBC digital servodrives and Vickers BRM and BRD analog servodrives. Type "V" windings are designed for use with Vickers range of 400/460 V<sub>AC</sub> digital drives; DBM04 (multiaxis) and DBS04 (singleaxis).

For heavy duty applications, Vickers recommended the use of their FAS F range. This is available in size 3 and is identical to the T3 range, except that it has an integral vent for forced cooling of the motor casing.

FAS F servomotors have met, with Vickers drives, the generic standards for industrial environment, related to the EMC Directive 89/336/EC. Tests have been made in independent test houses.

## STANDARD MODELS

- rare earth magnets
- 3-phase wye connected winding
- nominal voltage at nominal torque and nominal speed: 180V for M version and 325V for V version
- IP 64 protection, according to EN60529 (1991)
- class F insulation
- ambient temperature: -25°÷ +55°C
- storage temperature: -25°÷ +70°C
- IC 00 41 cooling (not for F3) [totally enclosed, not ventilated] according to EN60034-6 (1995)
- 6 pole servomotor and resolver (8 pole for size 4)
- B14 flange mounting for size 0 B5 for size 00, 1, 2, 3, and 4
- shielded bearings lubricated for life
- construction and mounting arrangement for size 0 is IM B14, IM V18 and IM V19; for size 00, 1, 2, 3 and 4 IM B5, IM V1 and IM V3 according to EN60034-7 (1993)
- shock: 30 g<sub>n</sub> per 11 ms, on two axis according to IEC 68-2-27 (1987)
- vibrations: 0,3 mm peak-to-peak up to 57 Hz, 2 g<sub>n</sub> from 57 Hz to 150 Hz, on two axis, according to IEC 68-2-6 (1982)
- cylindrical shaft with metric screwthread hole for mechanical interface mounting, according to DIN 332 (1983)
- dynamic balancing accuracy Q = 2,5 according to ISO 1940-1 (note: balancing with key, if applicable)
- black finish
- thermal protection using PTC with threshold at 130°C for M version and 155°C for V version
- PT bayonet signal connector (\*) and terminal board for power connection
- plug connectors (\*) included
- 90° indexable connector box (only for sizes 0,1,2 and 3)

- MTBF at 20°C,  $\Delta\theta_{win} = 65K$ , ground fixed motor:

53.000 hours

(\*) servomotor and resolver connection leads for T00.

## SPECIAL PRODUCTS

It is the custom in Vickers Electrics to design and manufacture special products to meet customer's needs.

### NOTE

Dimensions and tolerances in mm

## TECHNICAL DATA

Motor model  Characteristic and nominal values with sinusoidal drive		FAS T00			
		M2 060	M2 100	M4 060	M4 100
			V2 100		V4 100
Nominal torque, continuous duty, locked rotor, Δθ win = 65K*		0.3	0.3	0.56	0.56
		2.7	2.7	5.0	5.0
Nominal torque, continuous duty, locked rotor Δθ win = 110K*		0.4	0.4	0.74	0.74
		3.5	3.5	6.5	6.5
Peak torque, locked rotor		M	1.5	3	3
			13.3	26.6	26.6
		V	1.5		3
			13.3		26.6
Recommended drive		M	1.5/5	1.5/5	5/15
		V		3/9**	3/9
Max torque with recommended drive		M	1.16	.78	1.33
			10.3	6.9	11.8
		V	1.5		2.9
			13.3		25.7
Nominal speed		6000	10000	6000	10000
Theoretical nominal output power (Tn * ωn)		0.19	0.31	0.35	0.59
Output power, continuous duty nominal speed (Δθ win = 65K*)		0.126	0.105	0.188	0.209
Rotor inertia (resolver included)		17.3	17.3	26.3	26.3
		0.153	0.153	0.233	0.233
Mechanical time constant		M	3.98	3.69	2.16
		V		5.22	
Weight (resolver included)		1.26	1.26	1.65	1.65
Thermal impedance		2.2	2.2	1.7	1.7
Thermal time constant		490	490	500	500
Torque constant		M	0.36	0.24	0.39
		V		0.29	
Electrical time constant		M	0.71	0.76	1.04
		V		0.77	
Winding resistance at 20°C (68°F) (phase to phase)		M	17.2	7.1	7.2
		V		14.64	
Winding inductance (phase to phase)		M	12.2	5.4	7.5
		V		11.3	
Nominal current, locked rotor		M	0.85	1.27	1.4
		V		1.04	
Recommended power cable section		M	4 x 1	4 x 1	4 x 1
		V		4 x 1	

\* Ambient at 20°C (68°F) and flange at 45°C (113°F)

\*\* With drive max current limited via IL command (value specified on TORQUE-SPEED CURVES)

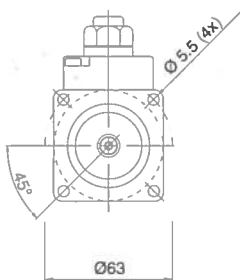
M= FAS T series servomotors matchable with 230 V<sub>AC</sub> DBM 03 drives

V= FAS T series servomotors matchable with 400/460 V<sub>AC</sub> DBS/DBM 04 drives

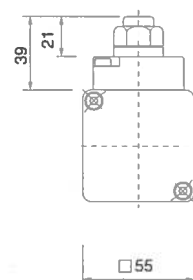
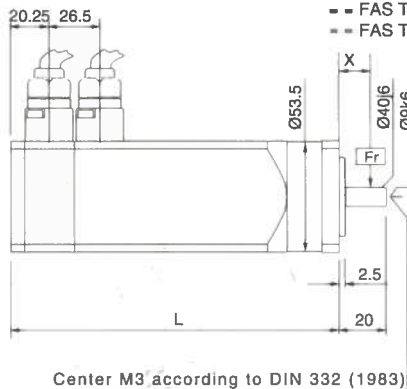
REMARK : the Nominal Torque, continuous duty,  $\Delta\theta_{win} = 110K$ , and the Peak Torque are not always achievable with the recommended drive.

## DIMENSIONS AND TOLERANCES

### FAS T00

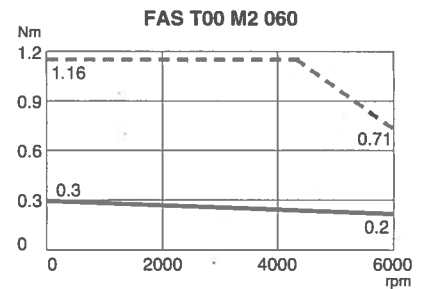


Type	L
M2-V2	135
M4-V4	165

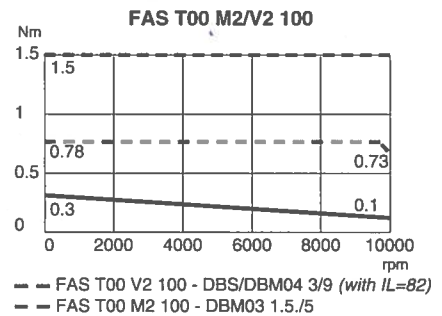


## TORQUE-SPEED CURVES

- Max torque with DBS/DBM04 drives at 460 V<sub>AC</sub> -5%, with programmable phase advance (see drive manual).
- Max torque with DBM03 drive at 230 V<sub>AC</sub> -5%.
- Nominal torque with all the drives ( $\Delta\theta_{win} = 65K$ )

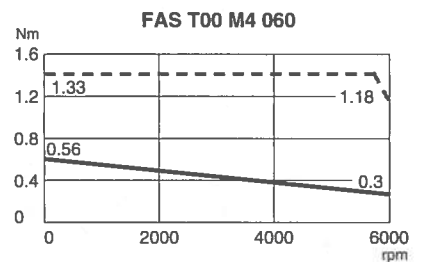


— FAS T00 M2 060 - DBM03 1.5/5

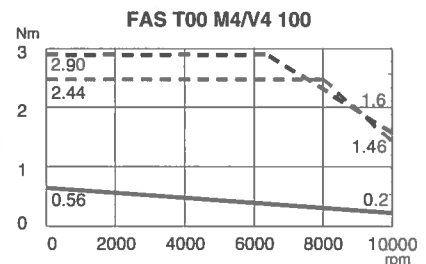


— FAS T00 V2 100 - DBS/DBM04 3/9 (with IL=82)

— FAS T00 M2 100 - DBM03 1.5/5



— FAS T00 M4 060 - DBM03 1.5/5



— FAS T00 V4 100 - DBS/DBM04 3/9

— FAS T00 M2 100 - DBM03 5/15

## TECHNICAL DATA

Motor model		FAS T0						Symbols	Unit
		M2 030	M2 060	M4 030	M4 060	M8 030	M8 060		
Characteristics and nominal values with sinusoidal drive	M								
	V		V2 060		V4 060		V8 060		
Nominal torque, continuous duty, locked rotor, $\Delta\theta_{win} = 65K^*$		0.5	0.5	1	1	1.9	1.9	$T_n$	N·M
		4.4	4.4	8.9	8.9	16.8	16.8		ln.lbs.
Nominal torque, continuous duty, locked rotor, $\Delta\theta_{win} = 110K^*$		0.6	0.6	1.25	1.25	2.3	2.3	$T_{110}$	N·M
		5.3	5.3	11.1	11.1	20.4	20.4		ln.lbs.
Peak torque, locked rotor		3	3	6	6	12	12	$T_m$	N·M
		26.6	26.6	53.1	53.1	106.2	106.2		ln.lbs.
Recommended drive	M	1.5/5	2.5/7.5	2.5/7.5	5/15	5/15	10/25	DBM03	
	V		3/9		3/9		8/22	DBS/DBM04	
Max torque with recommended drive	M	2.1	2	3.9	4.4	8.7	7.6	$T_{md}$	N·M
		18.6	17.7	34.5	38.9	77.0	67.3		ln.lbs.
	V		2.7		3.7		9		N·M
			23.9		32.7		79.7		ln.lbs.
Nominal speed		3000	6000	3000	6000	3000	6000	$\omega_n$	rpm
Theoretical nominal output power ( $T_n \cdot \omega_n$ )		0.16	0.31	0.31	0.63	0.60	1.19	$P_n$	kW
Output power, continuous duty nominal speed ( $\Delta\theta_{win} = 65K^*$ )		0.15	0.27	0.31	0.62	0.58	0.98	$P_{out}$	kW
Rotor inertia (resolver included)		58	58	78	78	118	118	$J_{10^{-6}}$	kgm <sup>2</sup>
		0.513	0.513	0.690	0.690	1.044	1.044	$J_{10^{-3}}$	ln.lbs. <sup>2</sup>
Mechanical time constant	M	10.71	10.70	4.93	4.37	2.61	3.02	$\tau_m$	10 <sup>-3</sup> s
	V		9.50		4.00		2.38		
Weight (resolver included)		2.3	2.3	2.8	2.8	3.7	3.7	m	kg
Thermal impedance		0.75	0.75	0.66	0.66	0.56	0.56	$R_{th}$	°C/W
Thermal time constant		710	710	790	790	1000	1000	$\tau_{th}$	s
Torque constant	M	0.62	0.39	0.74	0.42	0.82	0.43	$K_t$	Nm/A
	V		0.44		0.65		0.64		
Electrical time constant	M	1.63	1.67	2.3	2.28	2.87	2.47	$\tau_e$	10 <sup>-3</sup> s
	V		1.89		2.51		3.13		
Winding resistance at 20°C (68°F) (phase to phase)	M	41	16.2	20	5.7	8.6	2.73	$R_w$	Ω
	V		18.3		12.5		4.76		
Winding inductance (phase to phase)	M		27.1	46	13	24.64	6.75	$L_w$	mH
	V		34.5		31.4		14.9		
Nominal current, locked rotor	M	0.8	1.3	1.4	2.4	2.3	4.4	$I_n$	A
	V		1.1		1.5		3		
Recommended power cable section	M	4 x 1	4 x 1	4 x 1	4 x 1	4 x 1	4 x 1		mm <sup>2</sup>
	V		4 x 1		4 x 1		4 x 1		

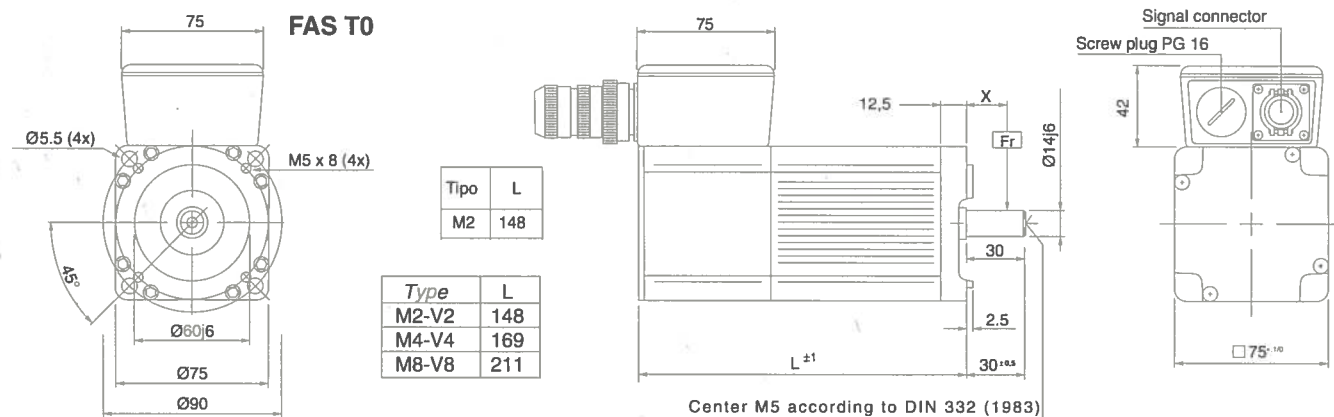
\* Ambient at 20°C (68°F) and flange at 45°C (113°F)

M= FAS T series servomotors matchable with 230 V<sub>AC</sub> DBM 03 drives

V= FAS T series servomotors matchable with 400/460 V<sub>AC</sub> DBS/DBM 04 drives

REMARK : the Nominal Torque, continuous duty,  $\Delta\theta_{win} = 110K$ , and the Peak Torque are not always achievable with the recommended drive.

## DIMENSIONS AND TOLERANCES

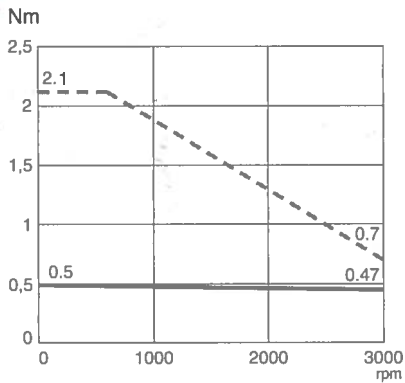




## TORQUE-SPEED CURVES

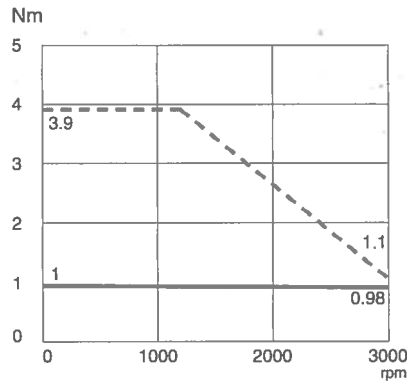
- Max torque with DBS/DBM04 drives at 460 V<sub>AC</sub> -5%, with programmable phase advance (see drive manual).
- Max torque with DBM03 drive at 230 V<sub>AC</sub> -5%.
- Nominal torque with all the drives ( $\Delta\theta_{win} = 65K$ )

FAS TO M2 030



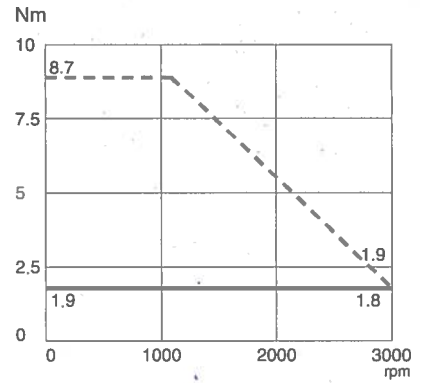
-- FAS TO M2 030 - DBM03 1.5/5

FAS TO M4 030



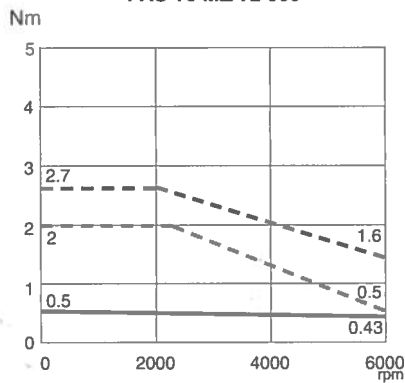
-- FAS TO M4 030 - DBM03 2.5/7.5

FAS TO M8 030



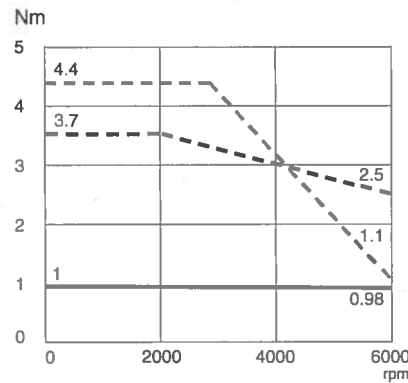
-- FAS TO M8 030 - DBM03 5/15

FAS TO M2/V2 060



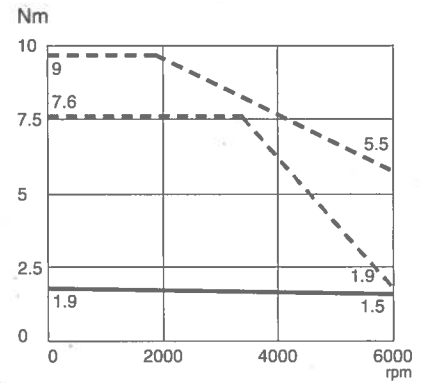
-- FAS TO V2 060 - DBS/DBM04 3/9  
-- FAS TO M2 060 - DBM03 2.5/7.5

FAS TO M4/V4 060

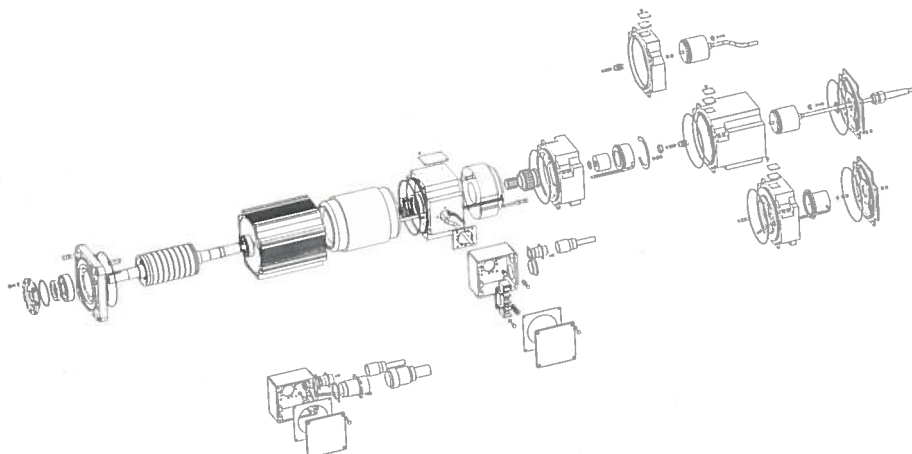


-- FAS TO V4 060 - DBS/DBM04 3/9  
-- FAS TO M4 060 - DBM03 5/15

FAS TO M8/V8 060



-- FAS TO V8 060 - DBS/DBM04 8/22  
-- FAS TO M8 060 - DBM03 10/25



## TECHNICAL DATA

Characteristics and nominal values with sinusoidal drive		Motor model		FAS T1								Symbols	Unit
				M2 030	M2 060	M4 030	M4 045	M6 030	M6 045	M8 030	M8 045		
		M	V2 030	V2 060	V4 030	V4 045	V6 030	V6 045	V8 030	V8 045			
Nominal torque, continuous duty, locked rotor, $\Delta\theta$ win = 65K*			2.1	2.1	3.9	3.9	5.9	5.9	7.4	7.4	$T_n$	N • M	
			18.6	18.6	34.5	34.5	52.2	52.2	65.5	65.5		In.lbs.	
Nominal torque, continuous duty, locked rotor, $\Delta\theta$ win = 110K*			2.7	2.7	4.8	4.8	7.2	7.2	9.1	9.1	$T_{110}$	N • M	
			23.9	23.9	42.4	42.4	63.7	63.7	80.5	80.5		In.lbs.	
Peak torque, locked rotor			10	10	18	18	24	24	30	30	$T_m$	N • M	
			88.5	88.5	159.3	159.3	212.4	212.4	265.5	265.5		In.lbs.	
Recommended drive		M	5/15	10/25	10/25	10/25	15/45	15/45	15/45	15/45	DBM03		
		V	3/9	8/22	8/22	8/22	8/22	15/42**	8/22	15/42	DBS/DBM04		
Max torque with recommended drive		M	8	6.9	13.8	9.2	24	16.6	25.5	17.7	$T_{md}$	N • M	
			70.8	61.1	122.1	81.4	212.4	146.9	225.7	156.6		In.lbs.	
		V	7.5	9	17	13	20	22	22	26	N • M		
			66.4	79.7	150.4	115.1	177.0	194.7	194.7	230.1	In.lbs.		
Nominal speed			3000	6000	3000	4500	3000	4500	3000	4500			
Theoretical nominal output power ( $T_n \cdot \omega_n$ )			0.66	1.32	1.22	1.84	1.85	2.78	2.32	3.49	$P_n$	kW	
Output power, continuous duty nominal speed ( $\Delta\theta$ win = 65K*)			0.54	0.75	0.97	1.13	1.29	1.41	1.6	1.65	$P_{out}$	kW	
Rotor inertia (resolver included)			265	265	415	415	525	525	680	680	$J10^{-6}$	kgm <sup>2</sup>	
			2.345	2.345	3.673	3.673	4.646	4.646	6.018	6.018	$J10^{-3}$	In.lbs. <sup>2</sup>	
Mechanical time constant		M	4.13	4.22	2.27	2.31	1.38	1.41	1.27	1.28	$\tau_m$	10 <sup>-3</sup> s	
		V	3.93	3.94	2.19	2.11	1.53	1.54	1.35	1.37			
Weight (resolver included)			4.2	4.2	6.2	6.2	8.5	8.5	10	10	m	kg	
Thermal impedance			0.51	0.51	0.46	0.46	0.42	0.42	0.38	0.38	$R_{th}$	°C/W	
Thermal time constant			1290	1290	1380	1380	1500	1500	1560	1560	$\tau_{th}$	s	
Torque constant		M	0.77	0.39	0.78	0.52	0.78	0.52	0.8	0.56	$K_t$	Nm/A	
		V	1.25	0.64	1.17	0.92	1.38	0.94	1.5	0.98			
Electrical time constant		M	4.31	4.43	5.89	5.83	8.08	7.86	7.83	7.65	$\tau_e$	10 <sup>-3</sup> s	
		V	4.61	4.77	6.01	6.35	7.23	7.13	7.29	7.14			
Winding resistance at 20°C (68°F) (phase to phase)		M	5.34	1.4	1.92	0.87	0.92	0.42	0.69	0.34	$R_w$	$\Omega$	
		V	13.37	3.52	4.17	2.49	3.21	1.5	2.58	1.12			
Winding inductance (phase to phase)		M	23	6.2	11.3	5.07	7.43	3.3	5.4	2.6	$L_w$	mH	
		V	61.6	16.8	25.05	15.8	23.2	10.7	18.8	8			
Nominal current, locked rotor		M	2.7	5.4	5	7.5	7.5	11.3	9.2	13.3	$I_n$	A	
		V	1.7	3.26	3.34	4.22	4.26	6.27	4.93	7.58			
Recommended power cable section		M	4 x 1	4 x 1	4 x 1	4 x 1.5	4 x 1.5	4 x 2.5	4 x 1.5	4 x 2.5		mm <sup>2</sup>	
		V	4 x 1	4 x 1	4 x 1	4 x 1	4 x 1	4 x 1.5	4 x 1	4 x 1.5			

\* Ambient at 20°C (68°F) and flange at 45°C (113°F)

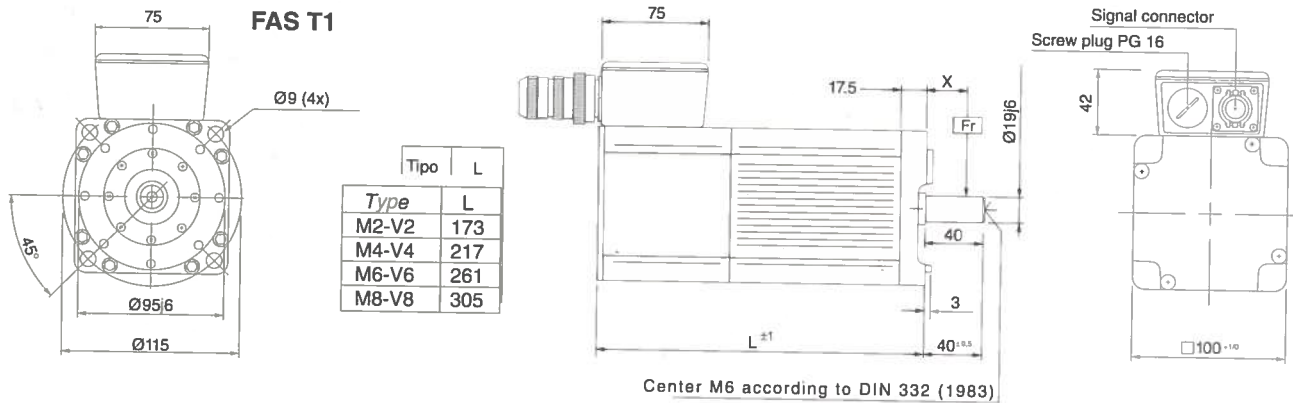
**\*\* With drive max current limited via IL command (value specified on TORQUE-SPEED CURVES)**

*M= FAS T series servomotors matchable with 230 V<sub>AC</sub> DBM 03 drives*

*V = FAS T series servomotors matchable with 400/460 V<sub>AC</sub> DBS/DBM 04 drives*

REMARK : the Nominal Torque, continuous duty,  $\Delta\theta_{win} = 110K$ , and the Peak Torque are not always achievable with the recommended drive.

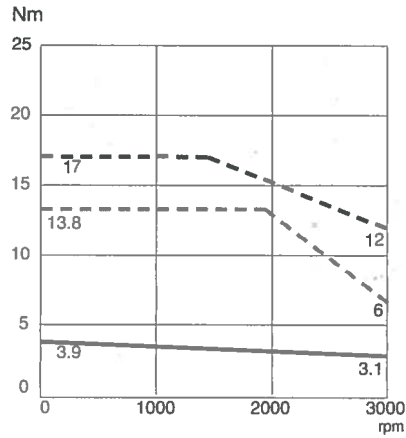
## ***DIMENSIONS AND TOLERANCES***



## TORQUE-SPEED CURVES

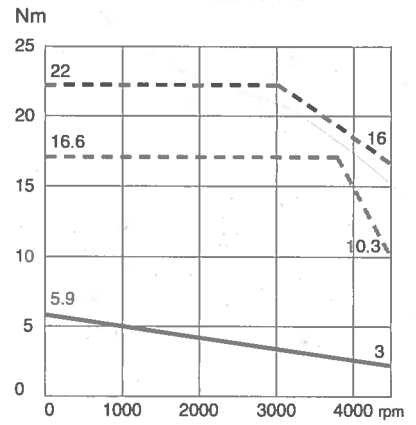
- Max torque with DBS/DBM04 drives at 460 V<sub>AC</sub> -5%, with programmable phase advance (see drive manual).
- Max torque with DBM03 drive at 230 V<sub>AC</sub> -5%.
- Nominal torque with all the drives ( $\Delta\theta_{win} = 65K$ )

FAS T1 M4/V4 030



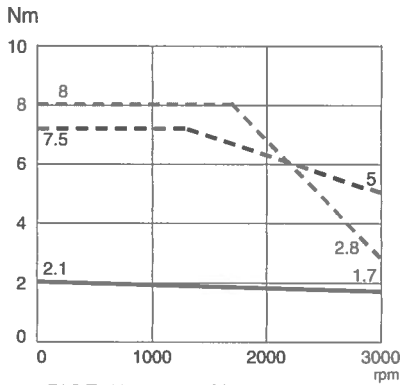
- FAS T1 V4 030 - DBS/DBM04 8/22
- FAS T1 M4 030 - DBM03 10/25

FAS T1 M6/V6 045



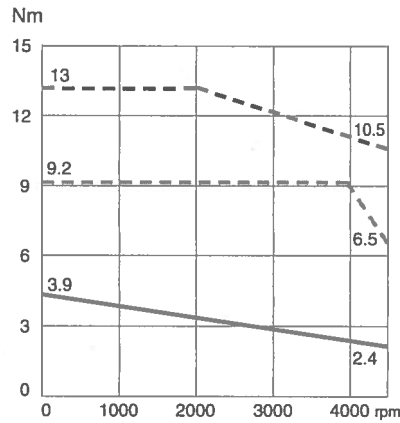
- FAS T1 V6 045 - DBS/DBM04 15/42 (with IL=88)
- FAS T1 M6 045 - DBM03 15/45

FAS T1 M2/V2 030



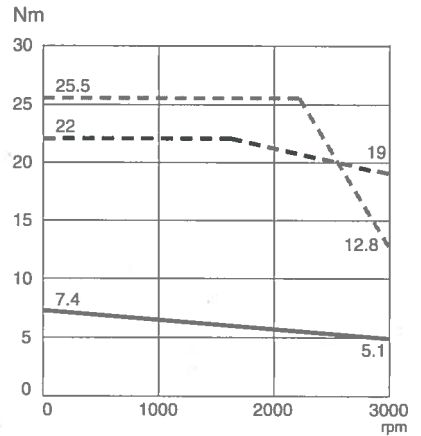
- FAS T1 V2 030 - DBS/DBM04 8/22
- FAS T1 M2 030 - DBM03 5/15

FAS T1 M4/V4 045



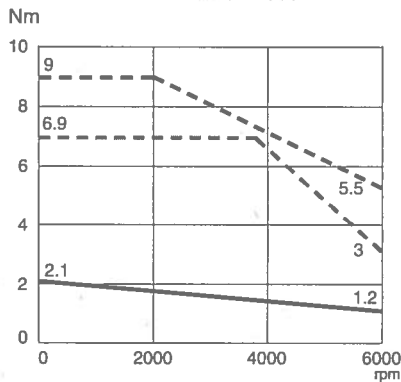
- FAS T1 V4 045 - DBS/DBM04 8/22
- FAS T1 M4 045 - DBM03 10/25

FAS T1 M8/V8 030



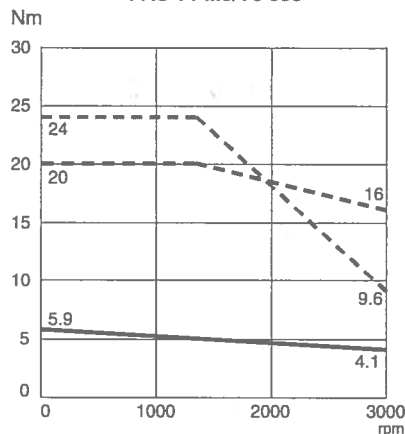
- FAS T1 V8 030 - DBS/DBM04 8/22
- FAS T1 M8 030 - DBM03 15/45

FAS T1 M2/V2 060



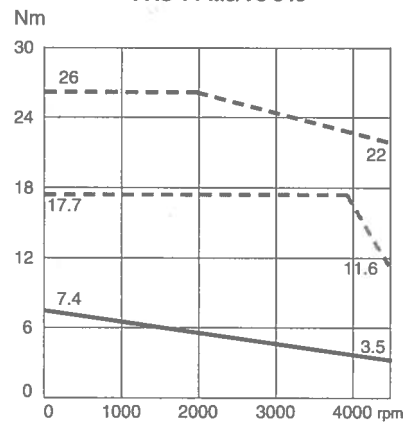
- FAS T1 V2 060 - DBS/DBM04 8/22
- FAS T1 M2 060 - DBM03 10/25

FAS T1 M6/V6 030



- FAS T1 V6 030 - DBS/DBM04 8/22
- FAS T1 M6 030 - DBM03 15/45

FAS T1 M8/V8 045



- FAS T1 V8 045 - DBS/DBM04 15/42
- FAS T1 M8 045 - DBM03 15/45

# TECHNICAL DATA

Characteristics and nominal values with sinusoidal drive	Motor model	FAS T2								Symbols	Unit
		M2 030	M2 045	M4 020	M4 030	M6 020	M6 030	M8 020	M8 030		
	V2 030	V2 045	V4 020	V4 030	V6 020	V6 030	V8 020	V8 030			
Nominal torque, continuous duty, locked rotor, $\Delta\theta_{win} = 65K^*$	M	7.5	7.5	12.5	12.5	18	18	23	23	$T_n$	N • M
	V	66.4	66.4	110.6	110.6	159.3	159.3	203.6	203.6		in.lbs
Nominal torque, continuous duty, locked rotor, $\Delta\theta_{win} = 110K^*$	M	7.5	7.5	13.5	13.5	19	19	24	24	$T_{110}$	N • M
	V	66.4	66.4	119.4	119.4	168.2	168.2	212.4	212.4		in.lbs
Peak torque, locked rotor	M	9.1	9.1	15	15	22	22	28.2	28.2	$T_m$	N • M
	V	80.5	80.5	132.8	132.8	194.7	194.7	249.6	249.6		in.lbs
Recommended drive	M	25	25	45	45	66	66	83	83	$T_m$	N • M
	V	221.2	221.2	398.3	398.3	584.1	584.1	734.6	734.6		in.lbs
Max torque with recommended drive	M	10/25	15/45	10/25	15/45	15/45	25/70	25/70	25/70	DBM03	
	V	8/22	15/42	8/22	15/42	15/42	15/42	15/42	25/70	DBS/DBM04	
Nominal speed	M	14.5	16.4	21.5	25.2	37.8	40.7	60.3	42.2	$T_{md}$	N • M
	V	128.3	145.1	190.3	223.0	334.5	360.2	533.7	373.5		in.lbs
Theoretical nominal output power ( $T_n \cdot \omega_n$ )	M	22	25	34	43	65	45	65	72	$T_{md}$	N • M
	V	194.7	221.3	300.9	380.6	575.3	398.3	575.3	637.2		in.lbs
Output power, continuous duty, nominal speed ( $\Delta\theta_{win} = 65K^*$ )	M	3000	4500	2000	3000	2000	3000	2000	3000	$\omega_n$	rpm
	V	2.36	3.53	2.62	3.93	3.77	5.65	4.81	7.22	$P_n$	kW
Rotor inertia (resolver included)	M	2.36	3.53	2.83	4.24	3.98	5.97	5.02	7.54	$P_{out}$	kW
	V	1.73	1.88	2.24	2.79	2.93	3.14	3.33	3.58		
Mechanical time constant	M	1.9	1.95	2.59	3	3.3	3.4	3.9	3.6	$J \cdot 10^{-4}$	kgm <sup>2</sup>
	V	1450	1450	2350	2350	3400	3400	4500	4500	$J \cdot 10^{-3}$	in.lbs
Weight (resolver included)	M	12.832	12.832	20.796	20.796	30.088	30.088	39.823	39.823	$\tau_m$	10 <sup>-3</sup> s
	V	5.19	5.41	3.01	3.00	2.41	2.58	2.36	2.27		
Thermal impedance	M	4.07	4.09	2.24	2.29	1.86	1.78	1.58	1.60	$m$	kg
	V	11	11	16	16	21	21	26	26	$R_{th}$	°C/W
Thermal time constant	M	0.21	0.21	0.18	0.18	0.16	0.16	0.15	0.15	$\tau_{th}$	s
	V	1180	1180	1400	1400	1550	1550	1700	1700	$K_t$	Nm/A
Torque constant	M	0.82	0.51	1.22	0.79	1.19	0.82	1.22	0.85		
	V	1.48	0.88	2.22	1.48	2.22	1.55	2.22	1.48	$\tau_e$	10 <sup>-3</sup> s
Electrical time constant	M	7.19	6.96	9.55	9.57	11.03	10.51	10.67	11.19	$R_w$	$\Omega$
	V	6.18	6.27	8.71	8.54	9.68	10.16	10.80	10.67	$L_w$	mH
Winding resistance at 20°C (68°F) (phase to phase)	M	1.39	0.56	1.1	0.46	0.58	0.295	0.45	0.21	$I_n$	A
	V	3.55	1.26	2.71	1.23	1.56	0.728	1	0.45		
Winding inductance (phase to phase)	M	10	3.9	10.5	4.4	6.4	3.1	4.8	2.35		
	V	21.95	7.9	23.6	10.5	15.1	7.4	10.8	4.8		
Nominal current, locked rotor	M	9.1	14.7	10.2	15.8	15.1	21.9	18.8	27		
	V	5.1	8.4	6.1	9.1	8.6	12.2	10.8	16.2		
Recommended power cable section	M	4 x 1.5	4 x 2.5	4 x 1.5	4 x 2.5	4 x 2.5	8 x 2.5	8 x 2.5	8 x 2.5		mm <sup>2</sup>
	V	4 x 1	4 x 1.5	4 x 1	4 x 1.5	4 x 1.5	8 x 1.5	4 x 1.5	4 x 2.5		

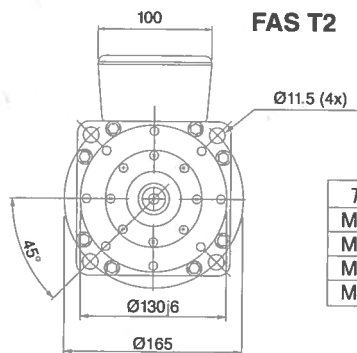
\* Ambient at 20°C (68°F) and flange at 45°C (113°F)

M= FAS T series servomotors matchable with 230 V<sub>AC</sub> DBM 03 drives

V= FAS T series servomotors matchable with 400/460 V<sub>AC</sub> DBS/DBM 04 drives

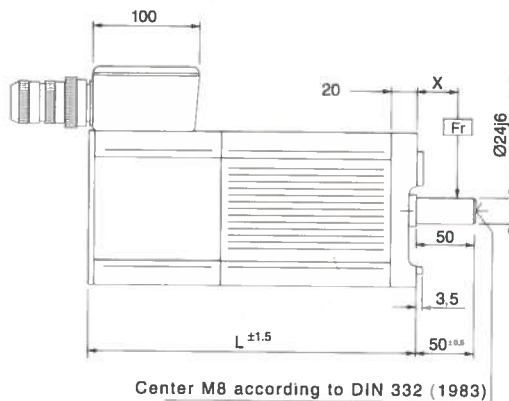
REMARK : the Nominal Torque, continuous duty,  $\Delta\theta_{win} = 110K$ , and the Peak Torque are not always achievable with the recommended drive.

## DIMENSIONS AND TOLERANCES

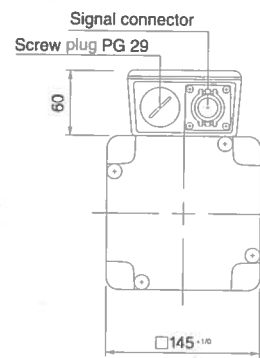


Type	L
M2-V2	220
M4-V4	274
M6-V6	328
M8-V8	382

Note: FAS T2 M8/V8 has two eyebolts.



Center M8 according to DIN 332 (1983)

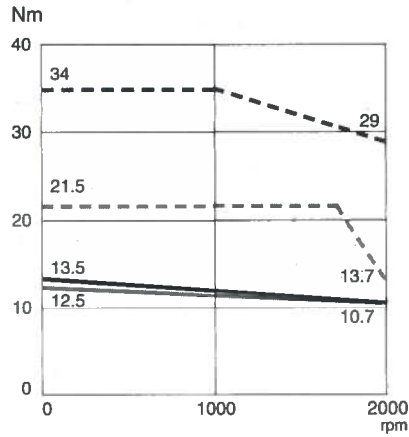




## TORQUE-SPEED CURVES

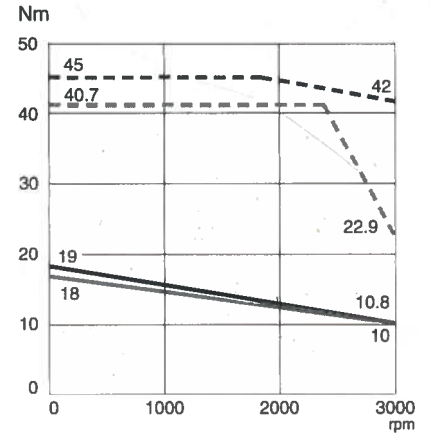
- Max torque with DBS/DBM04 drives at 460 V<sub>AC</sub> -5%, with programmable phase advance (see drive manual).
- Max torque with DBM03 drive at 230 V<sub>AC</sub> -5%.
- Nominal torque with DBS/DBM04, ( $\Delta\theta_{win} = 65K$ )
- Nominal torque with DBM03, ( $\Delta\theta_{win} = 65K$ )

FAS T2 M4/V4 020



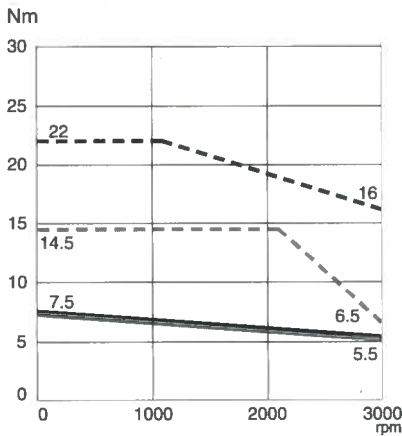
- FAS T2 V4 020 - DBS/DBM04 8/22
- FAS T2 M4 020 - DBM03 10/25

FAS T2 M6/V6 030



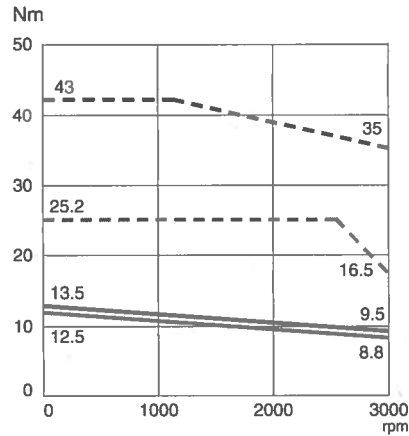
- FAS T2 V6 030 - DBS/DBM04 15/42
- FAS T2 M6 030 - DBM03 25/70

FAS T2 M2/V2 030



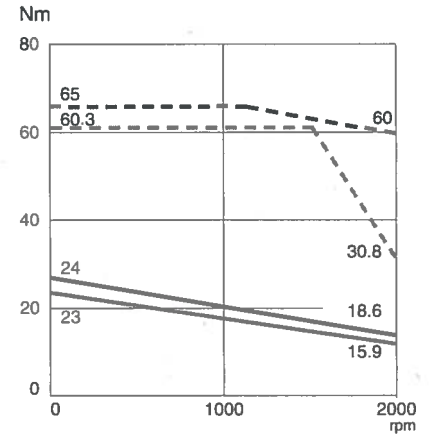
- FAS T2 V2 030 - DBS/DBM04 8/22
- FAS T2 M2 030 - DBM03 10/25

FAS T2 M4/V4 030



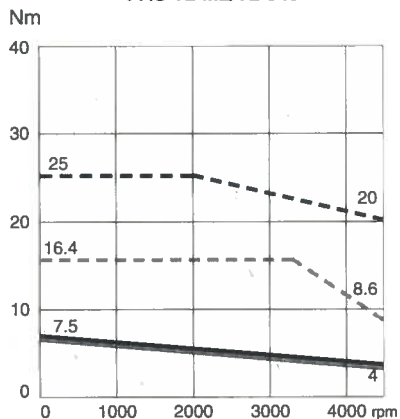
- FAS T2 V4 030 - DBS/DBM04 15/42
- FAS T2 M4 030 - DBM03 15/45

FAS T2 M8/V8 020



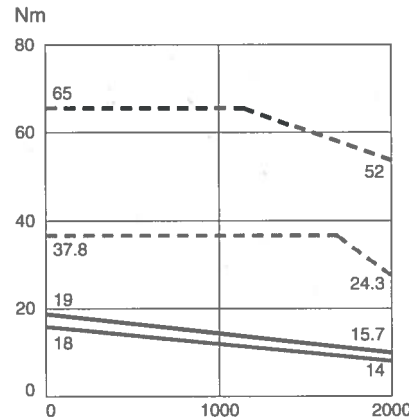
- FAS T2 V8 020 - DBS/DBM04 15/42
- FAS T2 M8 020 - DBM03 25/70

FAS T2 M2/V2 045



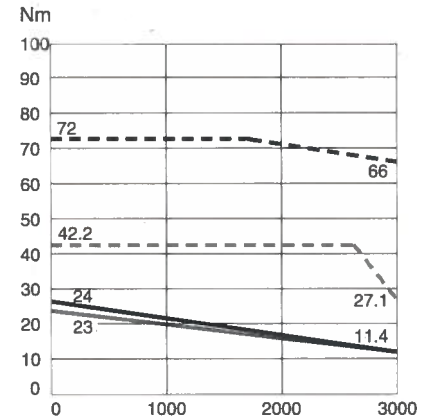
- FAS T2 V2 045 - DBS/DBM04 15/42
- FAS T2 M2 045 - DBM03 15/45

FAS T2 M6/V6 020



- FAS T2 V6 020 - DBS/DBM04 15/42
- FAS T2 M6 020 - DBM03 15/45

FAS T2 M8/V8 030



- FAS T2 V8 030 - DBS/DBM04 25/70
- FAS T2 M8 030 - DBM03 25/70

## TECHNICAL DATA

Characteristics and nominal values with sinusoidal drive	Motor model	FAS T3										Symbols	Unit
		M2 020	M2 030	M3 020	M3 030*	M4 020	M4 030*	M6 012	M6 020	M8 012	M8 020*		
	V	V2 020	V2 030	V3 020	V3 030**	V4 020	V4 030**	V6 012	V6 020	V8 012	V8 020**		
Nominal torque, continuous duty, locked rotor, $\Delta\theta_{win} = 65K^*$		26	26	36	36	48	48	68	68	87	87	$T_n$	N·m
		230	230	319	319	425	425	602	602	770	770		in.lbs.
Nominal torque, continuous duty, locked rotor, $\Delta\theta_{win} = 110K^*$		32	32	44	44	59	59	83	83	106	106	$T_{110}$	N·m
		283	283	389	389	522	522	735	735	938	938		in.lbs.
Peak torque, locked rotor		70	70	105	105	127.5	127.5	190	190	240	240	$T_m$	N·m
		620	620	929	929	1128	1128	1682	1682	2124	2124		in.lbs.
Recommended drive	M	25/70	30/90	30/90	50/140	50/140	70/180	30/90	70/180	50/140	80/240	DBM03	
	V	15/42	25/70	25/70	35/90	25/70	35/90	25/70	35/90	35/90	60/180**	DBS/DBM04	
Max torque with recommended drive	M	58	52	79	81	127	93	140	175	218	187	$T_{md}$	N·m
	V	513	460	699	717	1124	823	1239	1549	1929	1655		in.lbs.
		59	66	96	94	107	95	172	159	235	235		N·m
		522	584	850	832	947	841	1522	1407	2080	2080		in.lbs.
Nominal speed		2000	3000	2000	3000	2000	3000	1200	2000	1200	2000	$\omega_n$	rpm
Theoretical nominal output power ( $T_n \cdot \omega_n$ )		5.44	8.16	7.54	11.30	10.05	15.07	8.54	14.23	10.93	18.21	$P_n$	kW
Output power, continuous duty nominal speed ( $\Delta\theta_{win} = 65K^*$ )		4.1	4	5.4	5.3	7.1	5.3	7.1	9.8	9	11.3	$P_{out}$	kW
Rotor inertia (resolver included)		11300	11300	15150	15150	21000	21000	30175	30175	41150	41150	$J_{10^{-4}}$	kgm <sup>2</sup>
		100.00	100.00	134.07	134.07	185.84	185.84	267.04	267.04	364.16	364.16	$J_{10^{-3}}$	in.lbs <sup>2</sup>
Mechanical time constant	M	3.78	3.73	2.76	2.67	2.49	2.39	2.14	2.11	1.97	1.94	$\tau_m$	10 <sup>-3</sup> s
	V	4.24	4.17	3.17	3.32	2.88	2.91	2.50	2.43	2.35	2.27		
Weight (resolver included)		29	29	37	37	46	46	61	61	78	78	m	kg
Thermal impedance		0.135	0.135	0.122	0.122	0.115	0.115	0.1	0.1	0.095	0.095	$R_{th}$	°C/W
Thermal time constant		1850	1850	2050	2050	2270	2270	2550	2550	3050	3050	$\tau_{th}$	s
Torque constant	M	1.18	0.82	1.24	0.83	1.29	0.74	2.2	1.38	2.2	1.1	$K_t$	Nm/A
	V	2.05	1.37	2.06	1.54	2.26	1.55	3.61	2.58	3.78	2.42		
Electrical time constant	M	13.57	13.67	16.42	16.86	18.25	18.89	19.34	19.48	20.60	20.91	$\tau_e$	10 <sup>-3</sup> s
	V	65.26	13.83	16.41	15.67	17.75	17.92	18.75	19.35	19.66	20.22		
Winding resistance at 20°C (68°F) (phase to phase)	M	0.269	0.128	0.162	0.07	0.114	0.036	0.198	0.077	0.134	0.033	$R_w$	Ω
	V	0.91	0.4	0.512	0.3	0.404	0.192	0.624	0.31	0.472	0.186		
Winding inductance (phase to phase)	M	3.65	1.75	2.66	1.18	2.08	0.68	3.83	1.5	2.76	0.69	$L_w$	mH
	V	12.4	5.53	8.4	4.7	7.17	3.44	11.7	6	9.28	3.76		
Nominal current, locked rotor	M	22	31.7	29	43.5	37.3	65.2	30.8	49.3	39.4	78.8	$I_n$	A
	V	12.7	19	17.5	23.3	21.2	30.9	18.8	26.4	22.9	36		
Recommended power cable section	M	8 x 2.5	8 x 2.5	8 x 2.5	8 x 6	8 x 6	8 x 6	8 x 2.5	8 x 6	8 x 6	4 x 16		
	V	8 x 1.5	4 x 4	4 x 4	4 x 4	4 x 4	4 x 6	4 x 4	4 x 6	4 x 6	4 x 10		mm <sup>2</sup>

\* Ambient at 20°C (68°F) and flange at 45°C (113°F)

\*\* With drive max current limited via IL command (value specified on TORQUE-SPEED CURVES)

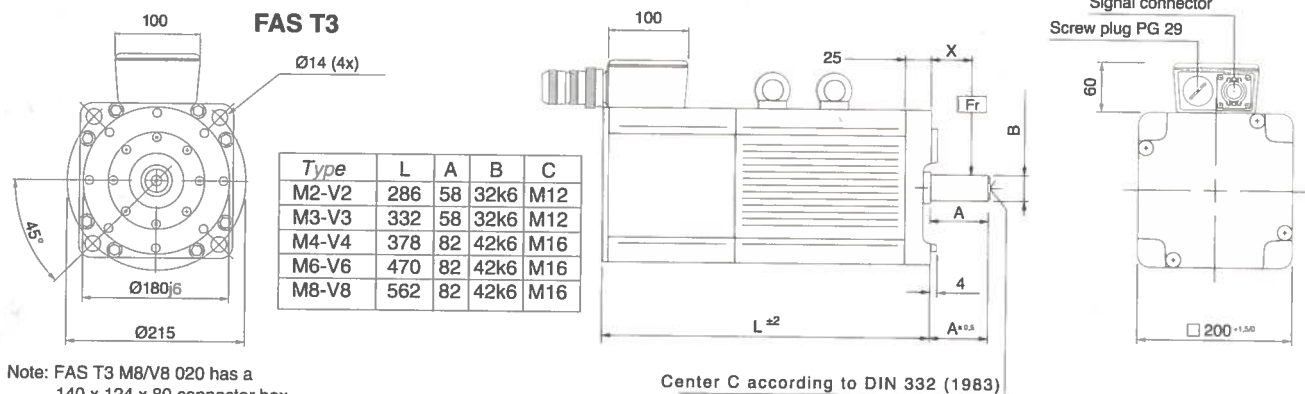
• With 0.25 mH choke in series for each motor phase - \*\* with 1.5 mH choke in series for each motor phase

M= FAS T series servomotors matchable with 230 V<sub>AC</sub> DBM 03 drives

V= FAS T series servomotors matchable with 400/460 V<sub>AC</sub> DBS/DBM 04 drives

REMARK : the Nominal Torque, continuous duty,  $\Delta\theta_{win} = 110K$ , and the Peak Torque are not always achievable with the recommended drive.

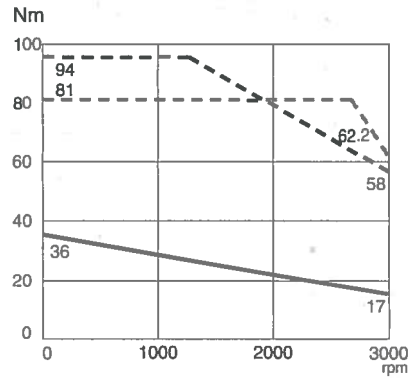
## DIMENSIONS AND TOLERANCES



## TORQUE-SPEED CURVES

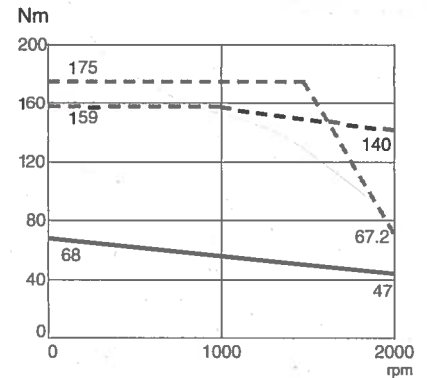
- Max torque with DBS/DBM04 drives at 460 V<sub>AC</sub> -5%, with programmable phase advance (see drive manual).
- Max torque with DBM03 drive at 230 V<sub>AC</sub> -5%.
- Nominal torque with all the drives, ( $\Delta\theta_{win} = 65K$ ).

FAS T3 M3/V3 030



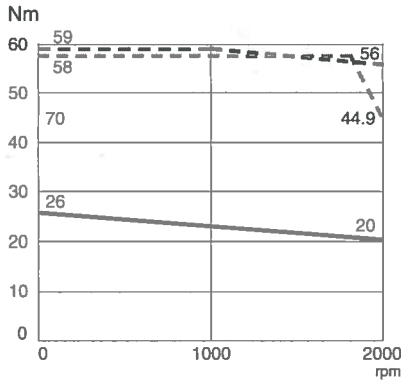
- FAS T3 V3 030 + 1.5 mH- DBS/DBM04 35/90
- FAS T3 M3 030 + 0.25 mH- DBM03 50/140

FAS T3 M6/V6 020



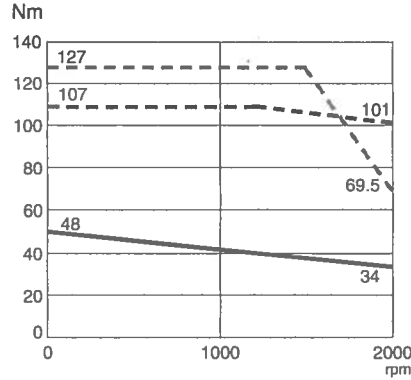
- FAS T3 V6 020 - DBS/DBM04 35/90
- FAS T3 M6 020 - DBM03 70/180

FAS T3 M2/V2 020



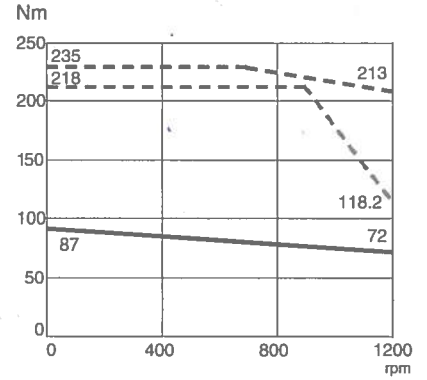
- FAS T3 V2 020 - DBS/DBM04 15/42
- FAS T3 M2 020 - DBM03 25/70

FAS T3 M4/V4 020



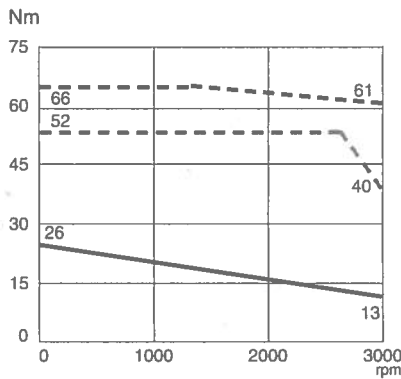
- FAS T3 V4 020 - DBS/DBM04 25/70
- FAS T3 M4 020 - DBM03 50/140

FAS T3 M8/V8 012



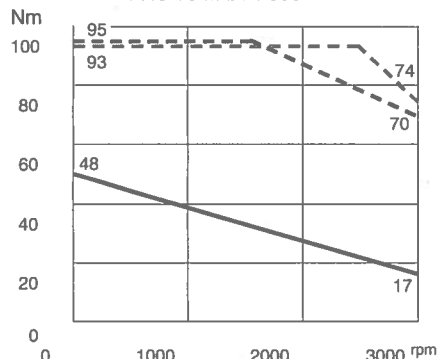
- FAS T3 V8 012 - DBS/DBM04 35/90
- FAS T3 M8 012 - DBM03 50/140

FAS T3 M2/V2 030



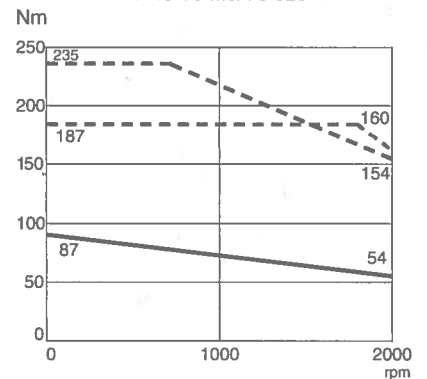
- FAS T3 V2 030 - DBS/DBM04 25/70
- FAS T3 M2 030 - DBM03 30/90

FAS T3 M4/V4 030



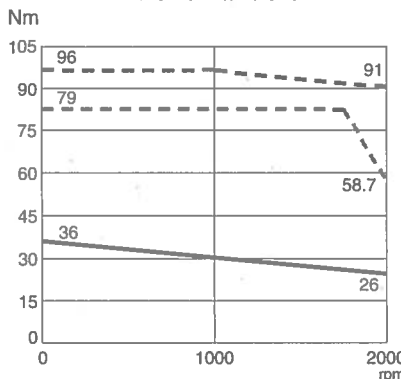
- FAS T3 V4 030 + 1.5 mH- DBS/DBM04 35/90
- FAS T3 M4 030 + 0.25 mH- DBM03 70/180

FAS T3 M8/V8 020



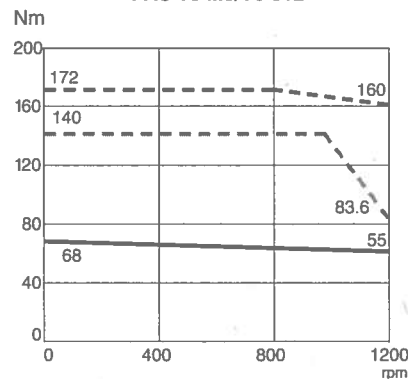
- FAS T3 V8 020 + 1.5 mH- DBS/DBM04 60/180
- FAS T3 M8 020 + 0.25 mH- DBS/DBM04 80/240 (with  $I_L=78$ )

FAS T3 M3/V3 020



- FAS T3 V3 020 - DBS/DBM04 25/70
- FAS T3 M3 020 - DBM03 30/90

FAS T3 M6/V6 012



- FAS T3 V6 012 - DBS/DBM04 25/70
- FAS T3 M6 012 - DBM03 30/90

## TECHNICAL DATA

Characteristics and nominal values with sinusoidal drive	Motor model	FAS F3										Symbols	Unit
		M2 020	M2 030	M3 020	M3 030*	M4 020	M4 030*	M6 012	M6 020	M8 012	n.d		
	V	V2 020	V2 030	V3 020	V3 030**	V4 020	V4 030**	V6 012	V6 020	V8 012	V8 020**		
Nominal torque, continuous duty, locked rotor, $\Delta\theta_{win} = 110K^*$		36	36	55	55	74	74	105	105	135	135	$T_{110}$	Nm
Peak torque, locked rotor		319	319	487	487	655	655	929	929	1195	1195		in.lbs
		70	70	105	105	127.5	127.5	190	190	240	240	$T_m$	N • M
		620	620	929	929	1128	1128	1682	1682	2124	2124		in.lbs
Recommended drive	M	50/140**	50/140**	50/140**	70/180	70/180**	80/240	50/140**	80/240**	70/180**	n.d.	DBM03	
	V	25/70**	25/70	25/70	35/90	35/90**	50/140**	35/90**	50/140**	35/90	60/180**	DBS/DBM04	
Max torque with recommended drive	M	70	70	105	105	127.5	125.5	190	190	240		$T_{md}$	N • M
	V	620	620	929	929	1128	1111	1682	1682	2124	n.d.		in.lbs
		70	66	96	94	127.5	127.5	190	190	235	235		N • M
		620	584	850	832	1128	1128	1682	1682	2080	2080		in.lbs
Nominal speed		2000	3000	2000	3000	2000	3000	1200	2000	1200	2000	$\omega_n$	rpm
Theoretical nominal output power ( $T_{110} \cdot \omega_n$ )		7.5	11.3	11.5	17.3	15.5	23.2	13.2	22.0	17.0	28.3	$P_n$	kW
Output power, continuous duty nominal speed ( $\Delta\theta_{win} = 110K^*$ )	M	7.2	8.9	9.4	13.2	12	16.2	11.6	15.5	13.8	n.d.	$P_{out}$	kW
	V	7.2	8.9	9.4	13.2	12	17.9	11.6	15.5	13.8	22.5		
Rotor inertia (resolver included)		11300	11300	15150	15150	21000	21000	30175	30175	41150	41150	$J_{10^{-4}}$	kgm <sup>2</sup>
		100.00	100.00	134.07	134.07	185.84	185.84	267.04	267.04	364.04	364.16	$J_{10^{-3}}$	in.lbs
Mechanical time constant	M	3.78	3.73	2.76	2.67	2.49	2.39	2.14	2.11	1.97	n.d.	$\tau_m$	10 <sup>-3</sup> s
	V	4.24	4.17	3.17	3.32	2.88	2.91	2.50	2.43	2.35	2.27		
Weight (resolver included)		34	34	42	42	52	52	71	71	89	89	m	kg
Torque constant	M	1.18	0.82	1.24	0.83	1.29	0.74	2.2	1.38	2.2	n.d.	$K_t$	Nm/A
	V	2.05	1.37	2.06	1.54	2.56	1.55	3.61	2.58	3.8	2.42		
Electrical time constant	M	13.6	13.7	16.4	16.9	18.2	18.9	19.3	19.5	20.6	n.d.	$\tau_e$	10 <sup>-3</sup> s
	V	13.6	13.8	16.4	15.7	17.7	17.9	19.1	19.4	19.7	20.2		
Winding resistance at 20°C (68°F) (phase to phase)	M	0.269	0.128	0.162	0.07	0.114	0.036	0.198	0.077	0.134	n.d.	$R_w$	$\Omega$
	V	0.91	0.4	0.512	0.3	0.404	0.192	0.614	0.31	0.472	0.186		
Winding inductance (phase to phase)	M	3.65	1.75	2.66	1.18	2.08	0.68	3.83	1.5	2.76	n.d.	$L_w$	mH
	V	12.4	5.53	8.4	4.7	7.17	3.44	11.7	6	9.28	3.76		
Nominal current, locked rotor, $\Delta\theta_{win} = 110K^*$ with recommended drive	M	30.5	43.9	44.4	66.3	57.4	79.7	48.6	77.5	62.3	n.d.	$I_n$	A
	V	17.6	26.3	26.7	35.7	28.9	47.7	29.1	40.7	35.5	55.8		
Recommended power cable section	M	8 x 6	8 x 6	8 x 6	8 x 6	8 x 6	4 x 16	8 x 6	4 x 16	8 x 6	n.d.		
	V	4 x 4	4 x 6	4 x 6	4 x 10	4 x 6	4 x 16	4 x 6	4 x 10	4 x 10	4 x 16		mm <sup>2</sup>

\* Ambient at 20°C (68°F) and flange at 45°C (113°F)

\*\* With drive max current limited via IL command (value specified on TORQUE-SPEED CURVES)

• With 0.25 mH choke in series for each motor phase - \*\* with 1.5 mH choke in series for each motor phase

M= FAS T series servomotors matchable with 230 V<sub>AC</sub> DBM 03 drives

V= FAS T series servomotors matchable with 400/460 V<sub>AC</sub> DBS/DBM 04 drives

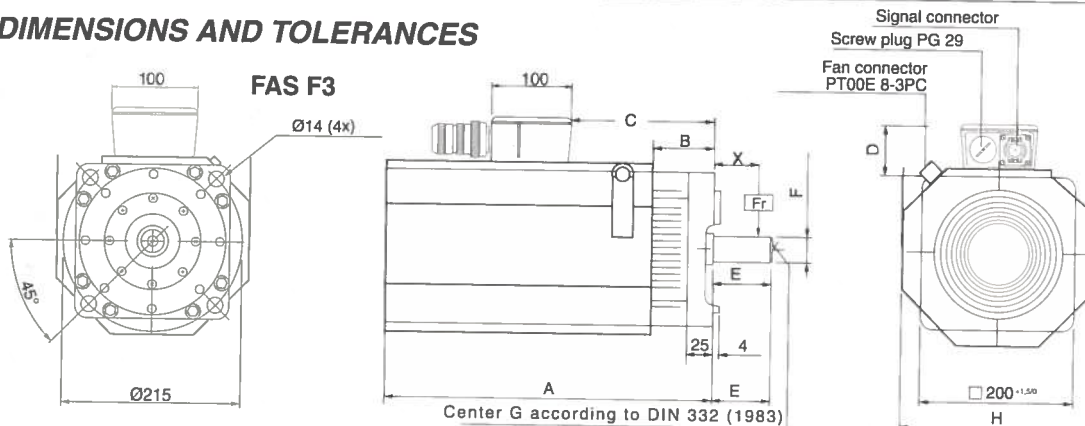
REMARK : the Nominal Torque, continuous duty,  $\Delta\theta_{win} = 110K$ , and the Peak Torque are not always achievable with the recommended drive.

ONLY the following options are available for F3 motors:

- Electric: safety brake, power connector
- Mechanical: keyed shaft, B14 flange, reduced tolerance, shaft seal

IP64-65-67 protection options are available for servomotors. Contact your Vickers appointed Service Centers for fan protection.

## DIMENSIONS AND TOLERANCES



Note: FAS F3 M3-V3, FAS F3 M4-V4, FAS F3 M6-V6, FAS F3 M8-V8 with power connector have a 140x124x80 mm connector box

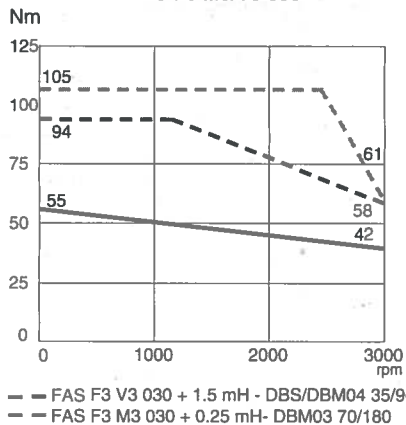
Type FAS F3	A	B	C	D	E	F	G	H
M2-V2	363	69	173	80	58	32k6	M12x28	225
M3-V3	409	69	219	80	58	32k6	M12x28	225
M4-V4	455	69	265	80	82	42k6	M16x36	225
M6-V6	590	60	357	95	82	42k6	M16x36	250
M8-V8	682	60	449	95	82	42k6	M16x36	250



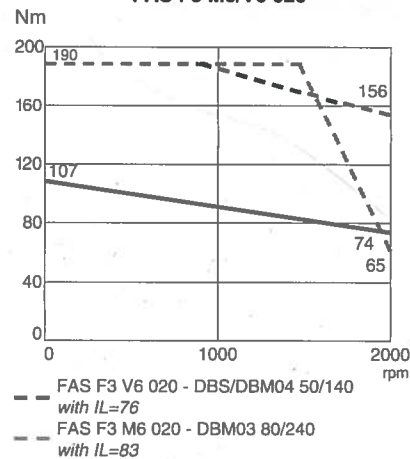
## TORQUE-SPEED CURVES

- Max torque with DBS/DBM04 drives at 400 V<sub>AC</sub> -5%, with programmable phase advance (see drive manual).
- Max torque with DBM03 drive at 230 V<sub>AC</sub> -5%.
- Nominal torque with DBS/DBM04 ( $\Delta\theta_{win} = 110K$ )
- Nominal torque with DBM03 ( $\Delta\theta_{win} = 110K$ )

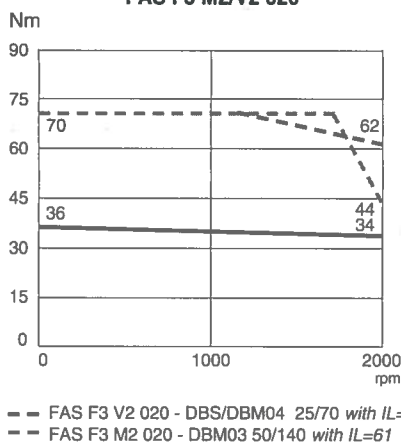
FAS F3 M3/V3 030



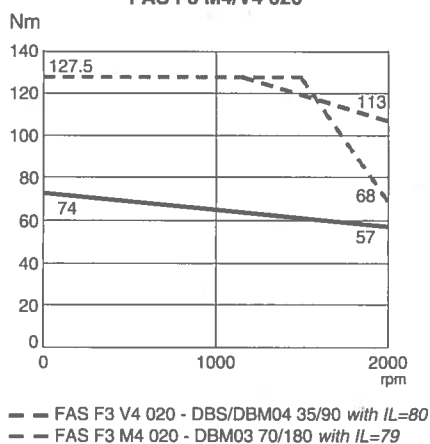
FAS F3 M6/V6 020



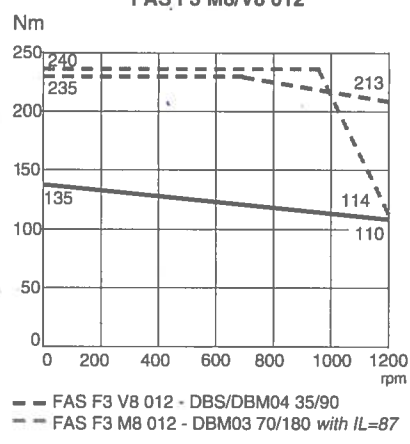
FAS F3 M2/V2 020



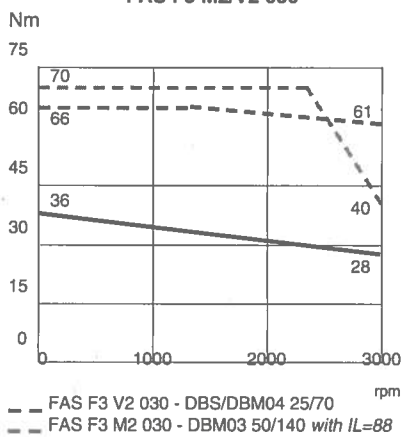
FAS F3 M4/V4 020



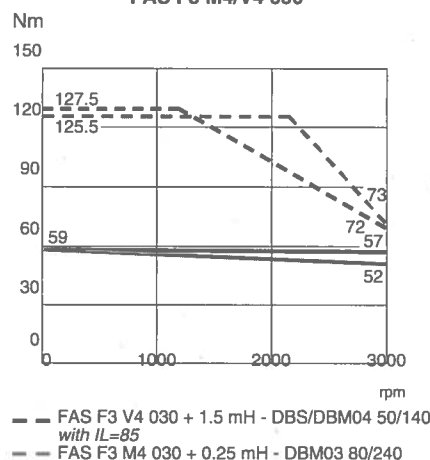
FAS F3 M8/V8 012



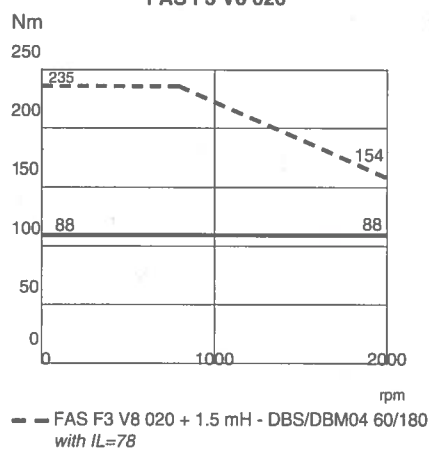
FAS F3 M2/V2 030



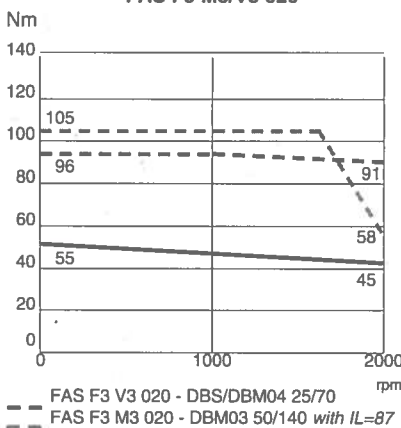
FAS F3 M4/V4 030



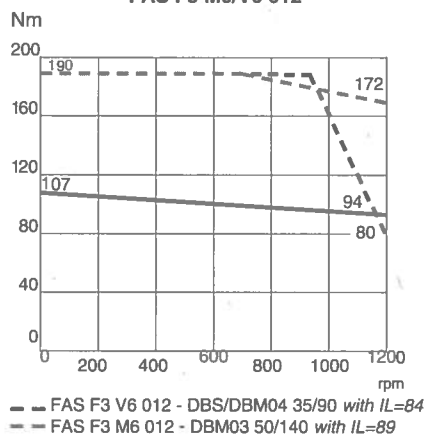
FAS F3 V8 020



FAS F3 M3/V3 020



FAS F3 M6/V6 012



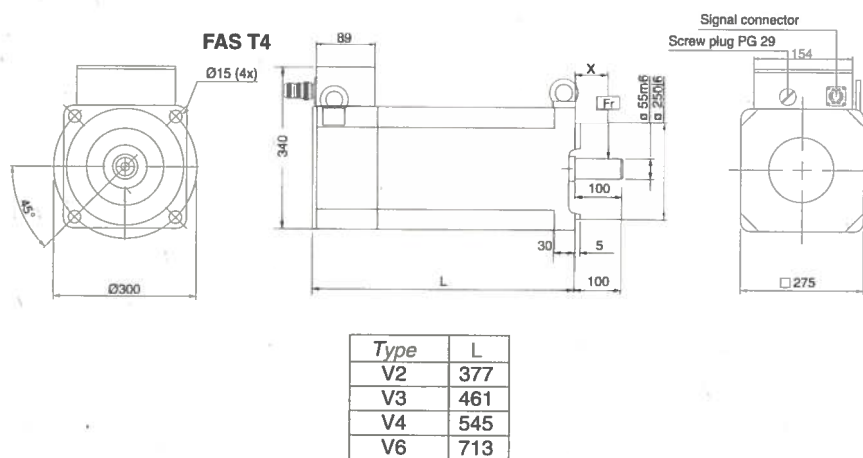
## TECHNICAL DATA

Motor model Characteristics and nominal values with sinusoidal drive	FAS T4				Symbol	Unit
	V2 020	V3 016	V4 012	V6 008		
Nominal torque, continuous duty, locked rotor, $\Delta\theta$ win = 65K*	100	140	185	260	$T_n$	N·M In.lbs
Nominal torque, continuous duty, locked rotor, $\Delta\theta$ win = 110K*	885	1239	1637	2301	$T_{110}$	N·M In.lbs
Peak torque, locked rotor	267	400	560	800	$T_m$	N·M In.lbs
Recommended drive	50/140	50/140	60/180	60/180		DBS/DBM04
Max torque with recommended drive	260	340	530	790	$T_{md}$	N·M In.lbs
Nominal speed	2000	1600	1200	800	$\omega_n$	rpm
Theoretical nominal output power ( $T_{110} \cdot \omega_n$ )	27	26	29	27	$P_n$	kW
Output power, continuous duty, nominal speed ( $\Delta\theta$ win = 110K*)	12.9	16.7	19.6	20.1	$P_{out}$	kW
Rotor inertia (resolver included)	56000	70000	86000	129000	$J_{10^{-4}}$	kgm <sup>2</sup> In.lbs
Mechanical time constant	0.90	0.72	0.64	0.56	$\tau_m$	10 <sup>-3</sup> s
Weight (resolver included)	93	116	138	183	$m$	kg
Thermal impedance	0.35	0.3	0.25	0.21	$R_{th}$	°C/W
Thermal time constant	3500	3800	4200	4900		
Torque constant	2.72	3.45	4.18	6.27	$K_t$	N·M/A
Electrical time constant	21.94	25.37	27.17	29.89		
Winding resistance at 20°C (68°F) (phase to phase)	0.072	0.067	0.069	0.094	$R_w$	OHMS
Winding inductance (phase to phase)	1.58	1.7	1.875	2.81	$L_w$	mH
Nominal current, locked rotor ( $\Delta\theta$ win = 110K*)	46	50.7	53.8	51	$I_n$	A
Recommended power cable section	4 x 16	4 x 16	4 x 16	4 x 16		mm <sup>2</sup>

\* Ambient at 20°C (68°F) and flange at 45°C (113°F)

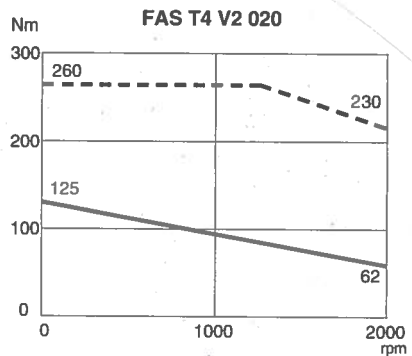
REMARK : FAS T4 servomotors matchable with 400-460 V<sub>AC</sub> DBS/DBM 04 servodrives

## DIMENSIONS AND TOLERANCES

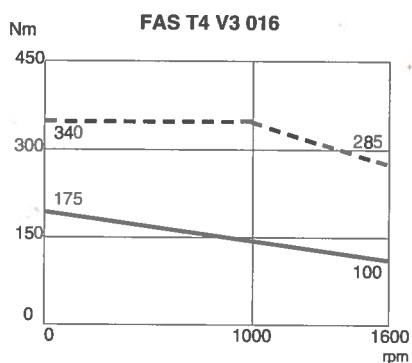


## TORQUE-SPEED CURVES

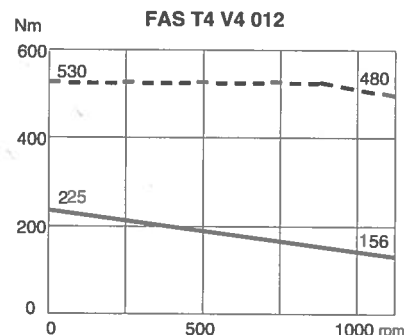
- Max torque with DBS/DBM04 drives at 460 V<sub>AC</sub> -5%, with programmable phase advance (see drive manual).
- Nominal torque with DBS/DBM04 ( $\Delta\theta$  win = 110K)



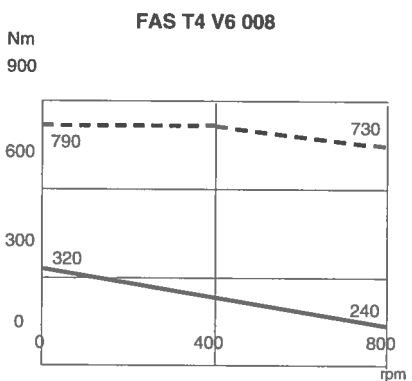
--- FAS T4 V2 020 - DBS/DBM04 50/140



--- FAS T4 V3 016 - DBS/DBM04 50/140



--- FAS T4 V4 012 - DBS/DBM04 60/180



--- FAS T4 V6 008 - DBS/DBM04 60/180

## RESOLVERS

VERSION	Model	Poles (n°)	Power Supply (Vrms)	Frequency (kHz)	Max Current (mA rms)	Max Error (min)	Phase Shift (degrees)	Z <sub>ro</sub> Input Imp. (Ω)	Z <sub>ss</sub> Output Imp. (Ω)	τ
Standard	T00	6	7.1	10	30	±8	4	70+j260	86+j160	0.5±5%
	T0-T1-T2-T3-F3	6	7.1	10	15	±10	1	275+j460	135+j430	0.3±5%
	T4	8	7.1	10	15	±8	3	20+j560	42+j500	0.3±5%
Optional	T00	2	7.1	10	28	±10	1	83+j280	72+j145	0.5±5%
	T0-T1-T2-T3-F3-T4	2	7.1	10	25	±10	7	165+j290	205+j426	0.5±5%

### RADIAL LOADS

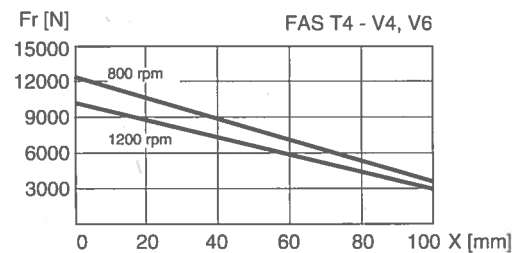
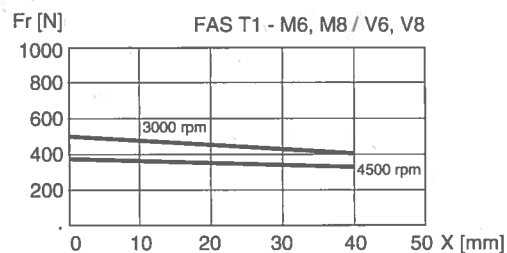
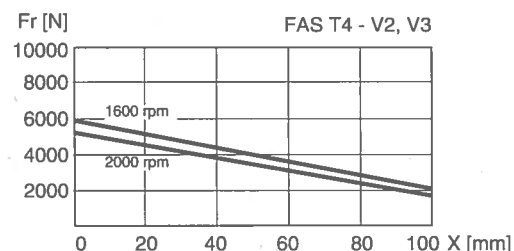
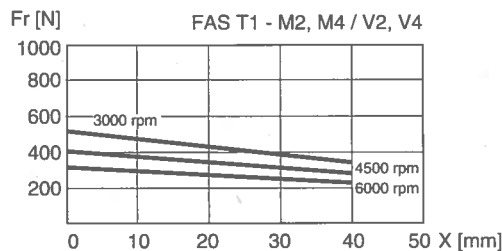
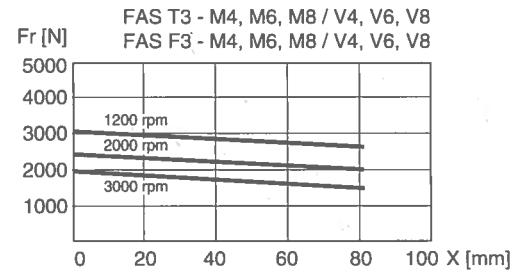
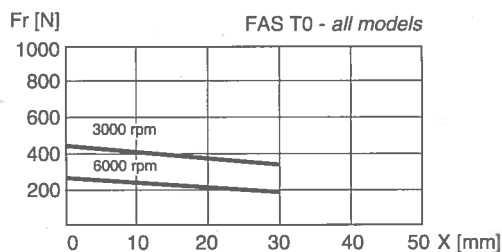
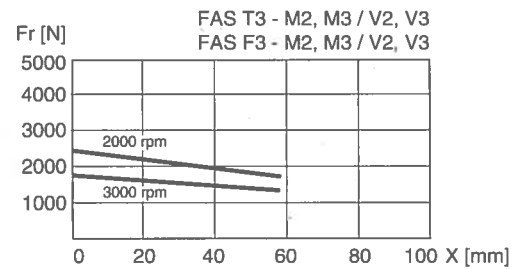
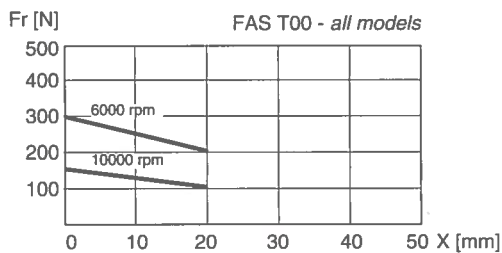
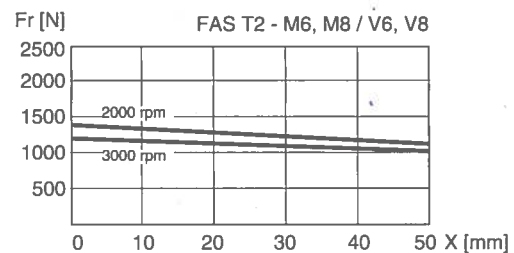
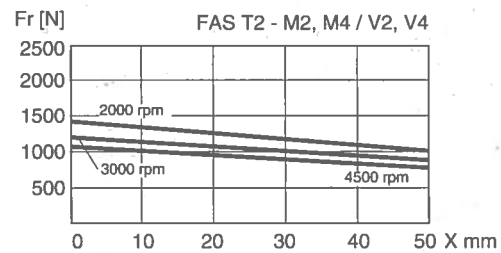
(see motor drawings for X[mm] dimension)

Maximum radial load on motor shaft  
vs. distance from flange and motor  
shaft speed referred to ball bearing  
rating life = 20000 h.

(reliability of 90%,  $\Delta\theta$  win = 65K).

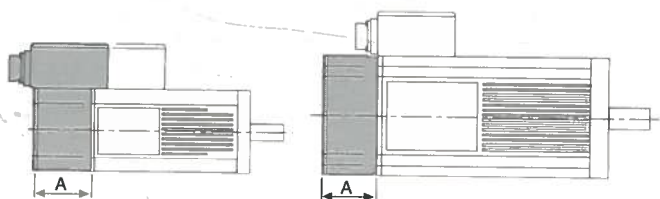
Note: maximum axial load must not  
exceed 30% of maximum radial load.

**Caution!** Avoid axial shock on shaft  
during assembling



## ELECTRICAL OPTIONS

**Safety brake (not available for T00)**



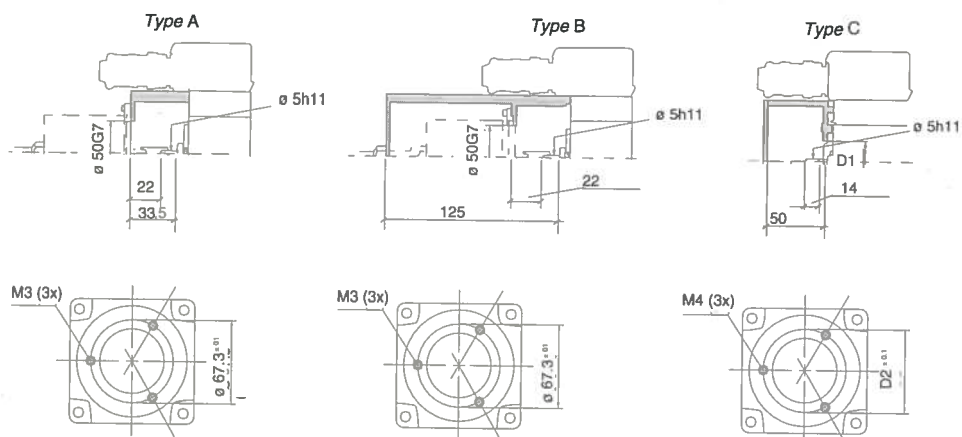
FAS T0

FAS T1, T2, T3, F3, T4

BRAKE CHARACTERISTICS	FAS T0	FAS T1	FAS T2	FAS T3/F3 FAS T4	Unit
Supply Voltage +10%-15%	24	24	24	24	Vdc
Supply current	0.5	0.750	1.75	2.3	A
Static brake holding torque	2.2	9	30	90	Nm
Inertia	17	50	446	2300	10 <sup>-4</sup> kgm <sup>2</sup>
Weight	1	1.8	5	12.3	kg
Max angular backlash	20	20	20	20	min
Length (A)	53	49	59	64	mm

Caution: brake will only release correctly when the supply is within the specified voltage range, the brake torques stated are calibrated and fixed values

**Optical encoder mounting kit (not available for T00, F3 and T4)**



Note (type B only): for FAS T0 motors the fixing holes are  $\varnothing 4,5$  on  $\varnothing 42 \pm 0,1$

Type	Mounting kit type				
	A	B	C		
	Weight kg	Weight kg	Weight kg	D1 mm	D2 mm
FAS T0	0.2	0.8	0.4	35	55
FAS T1	0.4	1.1	0.7	35	55
FAS T2	1	2	1.5	60	75
FAS T3	2	4.5	3.2	60	75

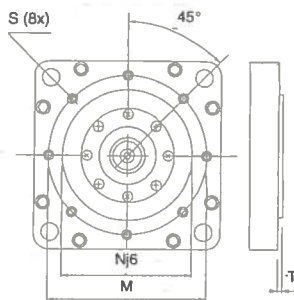
Code (see pag. 19)	Safety brake	Optical encoder type A mounting kit	Optical encoder type B mounting kit	Optical encoder type C mounting kit	Optical encoder mounted	Power connector (not for T00)
01						
02						
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Note: if the motor is equipped with optical encoder, the type of encoder is indicated in the last two digits of the motor code (special version)  
the type A assembly kit is incompatible with the IP65 and IP67 protection.

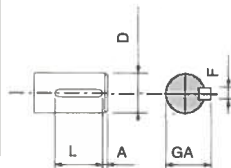


## MECHANICAL OPTIONS

### B14 Flange



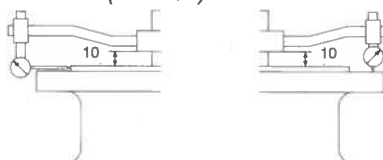
Type	N	M	T	S
FAS T1	70	85	2.5	M6x9
FAS T2	95	115	3	M8x12
FAS T/F3	130	165	3.5	M10x15
FAS T4	180	215	4	M12x18



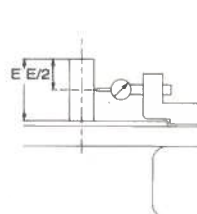
### Shaft with key according IEC 72-1 (1991-01)

Type	D	L	A	GA	F
FAS T00	9k6	14	3	10.2	3
FAS T0	14j6	20	3	16	5
FAS T1	19j6	25	3	21.5	6
FAS T2	24j6	32	3	27	8
FAS T/F3 M-V 2-3	32k6	40	4	35	10
FAS T/F3 M-V 4-8-8	42k6	70	5	45	12
FAS T4	55m6	70	5	59	16

### Eccentricity limit values according to IEC 72-1 (1991-01)



Type	Tolerance STD	Tolerance REDUCED
FAS T00	0.080	0.040
FAS T0	0.080	0.040
FAS T1	0.080	0.040
FAS T2	0.100	0.050
FAS T/F3	0.100	0.050
FAS T4	0.125	0.063



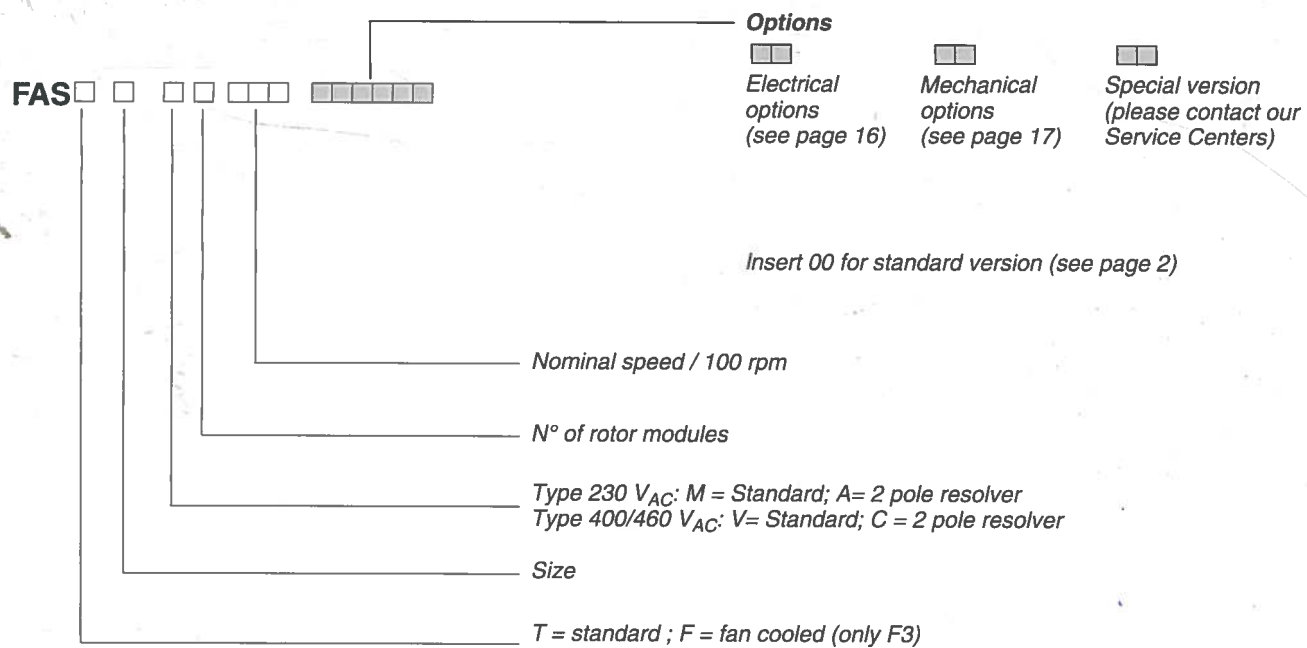
Type	Tolerance STD	Tolerance REDUCED
FAS T00	0.030	0.015
FAS T0	0.035	0.018
FAS T1	0.040	0.021
FAS T2	0.040	0.021
FAS T/F3	0.050	0.025
FAS T4	0.060	0.030

Code (see p.19)	Flange B14	IP 65 Protection EN60529 (1991)	Shaft with key IEC 72-1 (1991-01)	Reduced tolerance IEC 72-1 (1991-01)	Shaft seal *	IP 67 Protection * EN60529 (1991)
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Note: IP65 and IP67 protections do not include shaft exit.

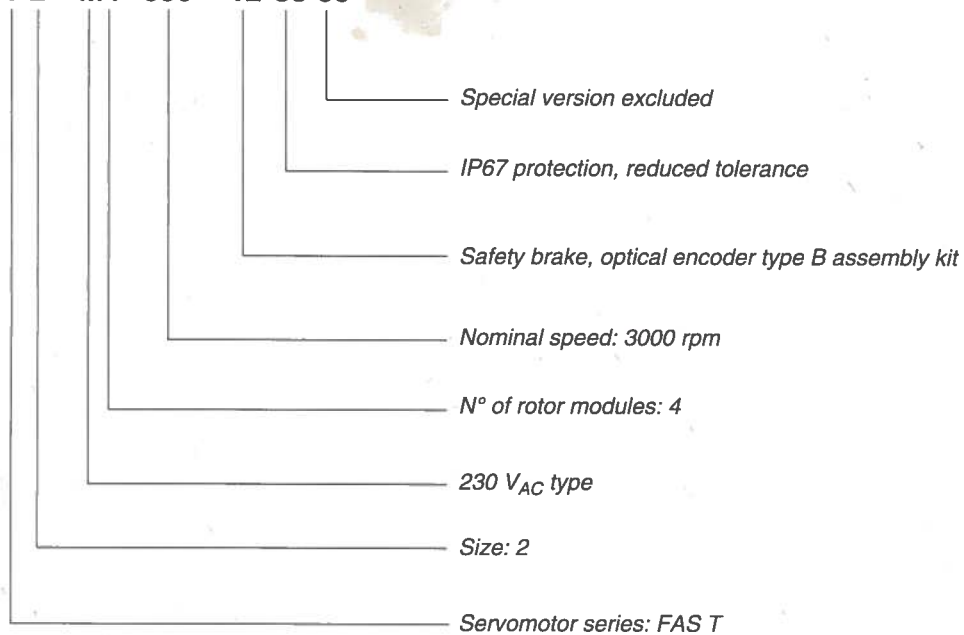
Geared motors with oil-tight reduction unit must have reduced tolerance and shaft exit seal

\*: not for T00; for F3 see note on page 12.

**MODEL CODE**

### Example

**FAST 2 M4 030 12 33 00**



Vickers Electronic Systems  
1151 W. Mason-Morrow R.  
Lebanon, Ohio 45036-9695  
U.S.A.  
513-494-1200  
Technical Support: 513-494-41

**Vickers Electronic Systems**  
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St. Martins Way  
Cambridge Road  
Bedford MK 42 0LF  
Bedfordshire  
England  
+44-1767-313504

**SINCERT**



**VICKERS**

**A TRINNOVA Company**

**Vickers Electronic Systems**  
Divisione della TRINNOVA SpA  
Via Avosso, 94  
16015 Casella (Genova) Italy  
Phone: +39 (10)-96711  
Fax: +39 (10)-9671280  
E-Mail: vesmotion@trinova.com



(F3)-F(R)G-10-\* -12/13

(F3)-FG-10-\* -15

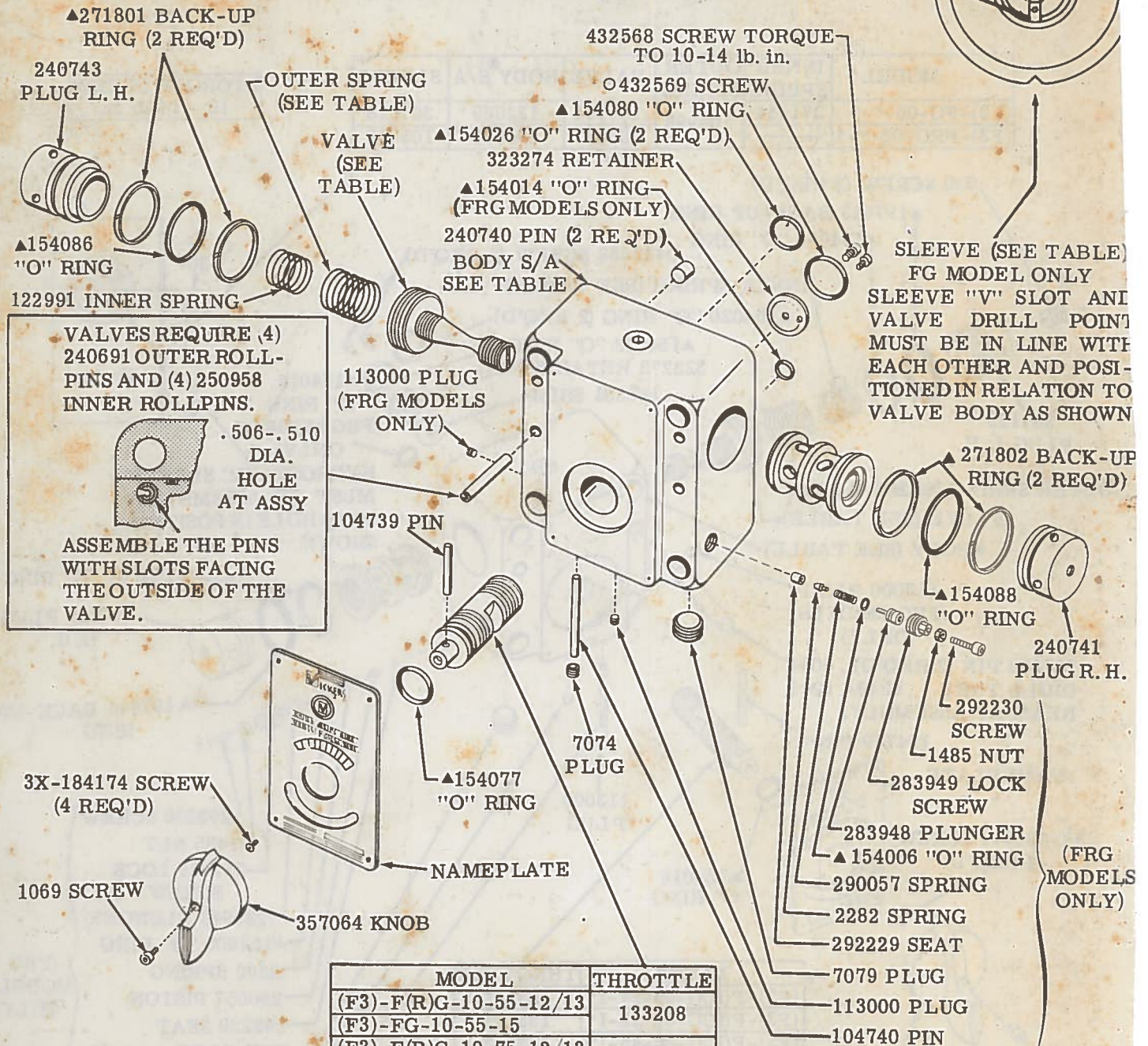
VALVE AND SLEEVE MUST  
BE REPLACED AS A SUB-  
ASSEMBLY IN THE  
FG-10-\* -12/13 MODELS

\*CAUTION  
ADD LEAD CHAMFER TO CROSS PIN  
HOLE IN HYDROSTAT SLEEVE BORE  
TO PREVENT CUTTING "O" RING AT  
ASSEMBLY.

MODEL	OUTER SPRING	VALVE	* BODY S/A	SLEEVE
(F3)-FG-10-* -12/13/15	122990	376086	246429	376085
(F3)-FRG-10-* -12/13	104697	●104736	292228	●104728

○TORQUE SCREW  
13 - 17 lb. in.

DRILL POINT



▲INCLUDED IN  
919450 SEAL KIT

F3 EQUIVALENT  
SEAL KIT 919898

●NOTE  
FOR -12 & -13 DESIGNS, ASSEMBLE  
SLEEVE AND VALVE AS SHOWN ON  
FRONT PAGE WITH HOLE 30° FROM  
HORIZONTAL CENTER LINE.

Litho in U. S. A.



01/22

# Service Parts Information

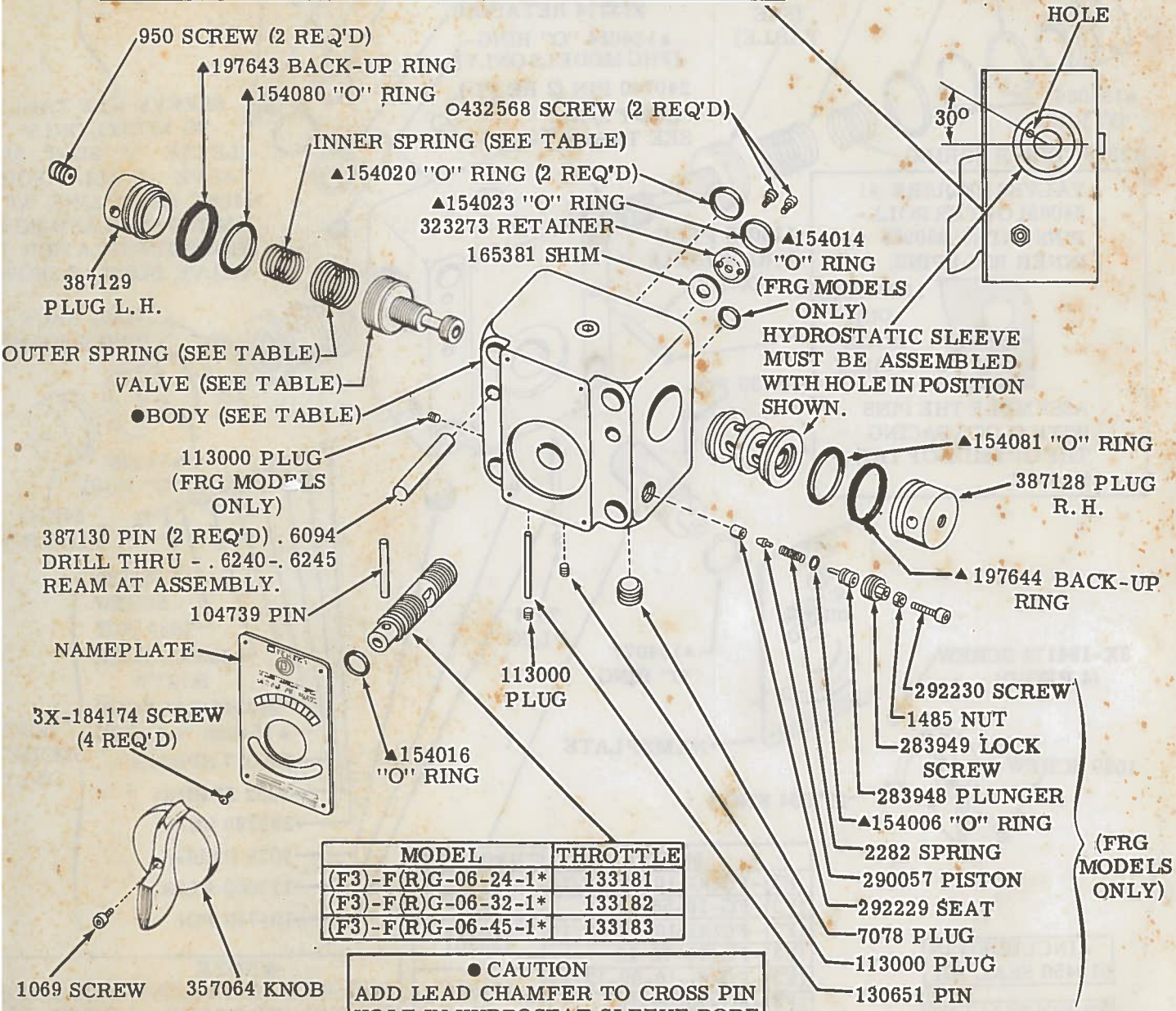
**VICKERS**  
A TRINOVIA COMPANY

FLOW  
CONTROL  
VALVES

F(R)G-06-\* -11/12/13

MODEL	INNER SPRING	OUTER SPRING	VALVE	BODY S/A	SLEEVE
(F3)-FG-06-*-*	271434	104998	105504	132069	307516
(F3)-FRG-06-*-*			105587	296633	105503

OTORQUE SCREW  
10 - 14 lb. in.



MODEL	THROTTLE
(F3)-F(R)G-06-24-1*	133181
(F3)-F(R)G-06-32-1*	133182
(F3)-F(R)G-06-45-1*	133183

● CAUTION  
ADD LEAD CHAMFER TO CROSS PIN  
HOLE IN HYDROSTAT SLEEVE BORE  
TO PREVENT CUTTING "O"RING AT  
ASSEMBLY.

F3 EQUIVALENT  
SEAL KIT 919897

▲ INCLUDED IN  
919449 SEAL KIT

Vickers, Incorporated  
P.O. Box 302  
Troy, Michigan 48007-0302

Revised 1-1-85

I-3402-S

203





## Power Amplifiers with CNC Adaptation Modules

### EEA-PAM-5\*\*-F-32 Series

#### General Description

The EEA-PAM-5\*\*-F-32 Eurocards are power amplifiers with integrated CNC adaptation modules. Each card replaces two conventional electronic cards.

These power amplifiers are used for high accuracy positioning systems with inexpensive standard proportional valves and CNC axis or PLC position controls.

#### Features and Benefits

- Includes all features of "A" amplifiers
- Hysteresis compensation for valves with/without feedback
- Enhanced deadband adjustment for closed-loop position control using valves with overlap
- This particular configuration reduces the amount of external wiring, saves space in the rack enclosure and requires only one 24V power supply

- Smooth transition between the overlap region and working region
- Low cost, high accuracy positioning systems with overlapped proportional valves. Non-linearities and inconsistencies (friction) in the overlap region are compensated by the electronic linearization
- Simple set-up procedure
- A built-in test function significantly simplifies commissioning (start-up) and fault-diagnosis

#### Front Panel

##### LEDs

- [1] 24V power supply input, green
- [2] 15V control supply output, green
- [3] Drive (solenoid) enabled, yellow
- [4] Overload, red
- [5] LVDT failure, red
- [6] Drive level to solenoid, yellow

##### Potentiometer

- [7] Offset

##### LED

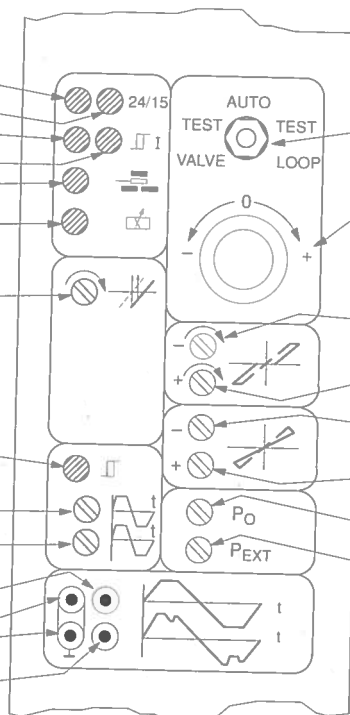
- [8] Ramps enabled, yellow

##### Potentiometers

- [9] Acceleration ramp
- [10] Deceleration ramp

##### Monitor points ■

- [11] MP1: Conditioned command signal
- [12] Common ground (0V)
- [13] MP2: LVDT (spool) position ▲



- [14] Mode switch
  - TEST VALVE setting
  - AUTO function setting
  - TEST LOOP setting

- [15] Test potentiometer

##### Potentiometers

- [16] Deadband compensation
- [17] Deadband compensation
- [18] Gain
- [19] Gain
- [20] Deadband gain
- [21] P-gain controller

■ Ø2,0 mm (0.0787" dia.) sockets.

▲ Solenoid current for EEA-PAM-523/525-F models.



This product has been designed and tested to meet specific standards outlined in the European Electromagnetic Compatibility Directive (EMC) 89/336/EEC, amended by 91/263/EEC, 92/31/EEC and 93/68/EEC, article 5. For instructions on installation requirements to achieve effective protection levels, see this leaflet and the Installation Wiring Practices for Vickers Electronic Products leaflet 2468. Wiring practices relevant to this Directive are indicated by Electromagnetic Compatibility (EMC).

## Model Codes


Amplifier model	For valves
EEA-PAM-523-F-32	KDG4V-3
EEA-PAM-525-F-32	KDG4V-5
EEA-PAM-533-F-32	KFDG4V-3
EEA-PAM-535-F-32	KFDG4V-5
EEA-PAM-561-F-32	KFDG5V-5/7
EEA-PAM-568-F-32	KFDG5V-8
EEA-PAM-581-F-32	KHDG5V-5/7/8



## Operating Data


Power (input) supply	bdz32	See appropriate base amplifier, e.g. for EEA-PAM-535-F-32 see EEA-PAM-535-A-32
Control (output) supplies	z22	+15V for LVDTs only
Reference voltages	z2 b2	+10V x 5 mA -10V x 5 mA
Analog inputs: Command inputs Direct-voltage inputs Inverting-voltage input Voltage range Input impedance (voltage) Current input Current range Input impedance (current) Input ramp Voltage range Input impedance Velocity demand signal Voltage range Input impedance	b6, b8, b10, z8 z10    d28   d10       d10	    $\pm 10V$ 47 k $\Omega$  $\pm 20$ mA 100 $\Omega$  $\pm 10V$ 10 k $\Omega$  $\pm 10V$ 15 k $\Omega$
Digital inputs: Drive enable (power available to solenoid) Ramps enable Enabled Disabled Load current	z24 b24    	 17 to 40V 0 to 3,5V $\leq 10$ mA
Analog outputs: P-controller output Voltage range Load impedance Output ramp generator Voltage range Load impedance	  d12  d26   	  $\pm 10V$ $\geq 10$ k $\Omega$ ; short-circuit proof  $\pm 10V$ $\geq 10$ k $\Omega$ ; short-circuit proof

Continued on next page

<p>Alarm output: Set alarm Signal</p>  <p>Reset after failure</p>	<p>z12</p> <p>Enable amplifier (on pin z24) when switching power on. HIGH when alarm is activated. Output = Supply volts minus 2 volts. I = 50 mA max. LOW when solenoid overload has occurred. (Maintained until reset). Output = 0 to +/-2 volts. Output resistance = 50 ohms. Disable and re-enable on pin z24.</p>
<p>Potentiometers: Deadband compensation, separate control for each solenoid Gain, separate control for each solenoid P<sub>0</sub>-Deadband gain P<sub>EXT</sub>-Gain controller: Without link Link</p>	<p>d18 to d20</p> <p>0 to 50% 40 to 90% 15 to 43 times 0,1 to 5 times 2 to 100 times</p>
<p>Integrated P-controller</p>	<p>The input circuit of the power amplifier card is used as a differential amplifier between the demand and feedback signals. The ramp signal generator can be used as profile generator.</p> <p><b>Caution:</b> When using "TEST LOOP" the command signal has to be connected to d8, and d14 has to be connected to the command signal input of the input stage.</p>
<p>Hysteresis compensation: Link</p>	<p>d2 to d6</p> <p>For KDG4V-* valves only</p>
<p>Monitor points: Conditioned command signal power amplifier LVDT (spool) position ▲ Voltage range Monitor point impedance</p>	<p>MP1 MP2</p> <p>± 10V 10 kΩ</p>
<p>Ambient conditions: Storage temperature range Operating temperature range</p>	<p>-25 to +85°C (-13 to +185°F) 0 to 50°C (32 to 122°F)</p>
<p>Mass</p>	<p>0,4 kg (0.88 lb) approx.</p>
<p>Installation and start-up guidelines (supplied with product) Installation wiring requirements for Vickers electronic products Application notes (available on request)</p>	<p>9171 2468 9059</p>
<p>Integrated test modes</p>	<p>See three pages on</p>
<p>Supporting products: Power supply unit options Electronic accessories Portable test equipment</p>	<p>See catalogs: 2419 2460 2462 and 2315</p>

▲ Solenoid current for EEA-PAM-523/525-F models.



<p>Alarm output: Set alarm Signal</p> <p>z12</p>  <p>Reset after failure</p>	<p>Enable amplifier (on pin z24) when switching power on. HIGH when alarm is activated. Output = Supply volts minus 2 volts. I = 50 mA max. LOW when solenoid overload has occurred. (Maintained until reset). Output = 0 to +/-2 volts. Output resistance = 50 ohms. Disable and re-enable on pin z24.</p>
<p>Potentiometers: Deadband compensation, separate control for each solenoid Gain, separate control for each solenoid P<sub>0</sub>-Deadband gain P<sub>EXT</sub>-Gain controller: Without link Link</p> <p>d18 to d20</p>	<p>0 to 50% 40 to 90% 15 to 43 times  0,1 to 5 times 2 to 100 times</p>
<p>Integrated P-controller</p>	<p>The input circuit of the power amplifier card is used as a differential amplifier between the demand and feedback signals. The ramp signal generator can be used as profile generator.</p> <p><b>Caution:</b> When using "TEST LOOP" the command signal has to be connected to d8, and d14 has to be connected to the command signal input of the input stage.</p>
<p>Hysteresis compensation: Link</p> <p>d2 to d6</p>	<p>For KDG4V-* valves only</p>
<p>Monitor points: Conditioned command signal power amplifier LVDT (spool) position ▲ Voltage range Monitor point impedance</p> <p>MP1 MP2</p>	<p>± 10V 10 kΩ</p>
<p>Ambient conditions: Storage temperature range Operating temperature range</p>	<p>-25 to +85°C (-13 to +185°F) 0 to 50°C (32 to 122°F)</p>
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<p>Integrated test modes</p>	<p>See three pages on</p>
<p>Supporting products: Power supply unit options Electronic accessories Portable test equipment</p>	<p>See catalogs: 2419 2460 2462 and 2315</p>

▲ Solenoid current for EEA-PAM-523/525-F models.

## Operation of the Integrated Test Mode

The basic operation of the hydraulic actuator can be tested by using the 3-position mode switch mounted on the front panel. To select different modes the toggle switch must be lifted slightly before moving to a new position.

### Caution:

Before setting the mode switch to either "Test valve" or "Test loop" make sure the test potentiometer is set to "0". Otherwise sudden movements of the actuator may occur.

The mode switch has three positions:  
AUTO

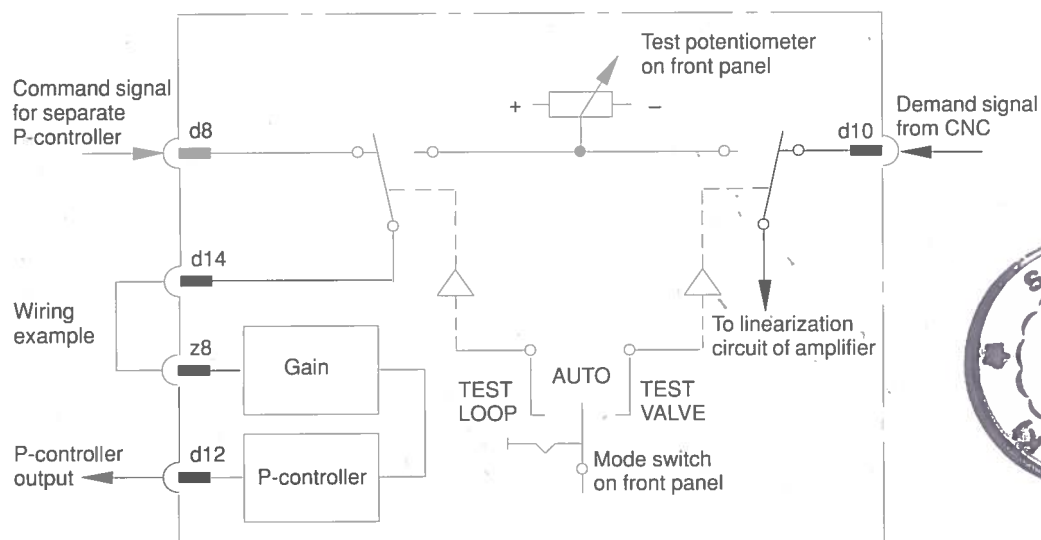
The controller operates in closed-loop mode, using the external command signal. The test potentiometer is disconnected.

### TEST VALVE

An open-loop command signal for the valve comes directly from the potentiometer. The external input signal is disconnected. The hydraulic part of the system may be tested in this configuration.

### TEST LOOP

The test potentiometer can be used to drive the separate P-controller, if "Test loop" (closed spool) is selected. The external input signal is disconnected. See wiring example. "Test loop" is usable only if the separate P-controller is used.



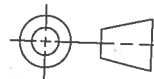
# Solenoid and LVDT Connections for Proportional Valves

Amplifier type	Solenoid with LVDT and/or for flow P to B	Solenoid without LVDT, or on pilot valve	Pilot-stage LVDT, (black plug):				Main-stage LVDT, (gray plug):			
			Pin 1	Pin 2	Pin 3	Pin 4	Pin 1	Pin 2	Pin 3	Pin 4
EEA-PAM-523-F-32	b26/b28	z26/z28	—	—	—	Not connected	—	—	—	Not connected
EEA-PAM-525-F-32	b26/b28	z26/z28	—	—	—	Not connected	—	—	—	Not connected
EEA-PAM-533-F-32	b26/b28	z26/z28	—	—	—	Not connected	b14	z22	b16	Not connected
EEA-PAM-535-F-32	b26/b28	z26/z28	—	—	—	Not connected	b14	z22	b16	Not connected
EEA-PAM-561-F-32	—	z26/z28	—	—	—	Not connected	b14	z22	b16	Not connected
EEA-PAM-568-F-32	—	z26/z28	—	—	—	Not connected	b14	z22	b16	Not connected
EEA-PAM-581-F-32	—	z26/z28	z14	z22	z16	Not connected	b14	z22	b16	Not connected

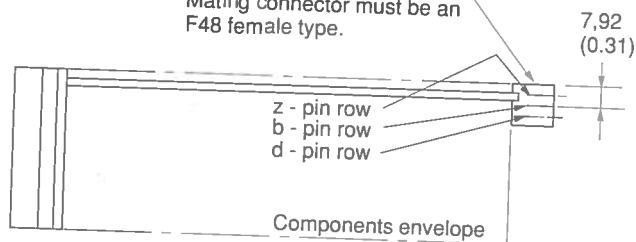
## Installation Dimensions in mm (inches)

Plug-in Unit of 3U Height, to IEC 297

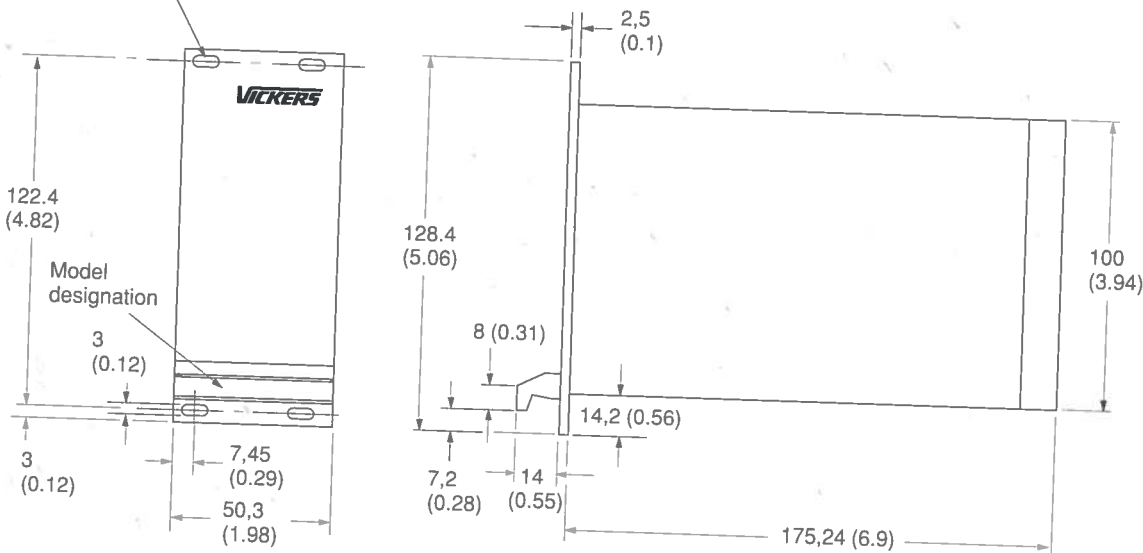
3rd angle projection



DIN 41612 F48 male connector.  
Mating connector must be an F48 female type.

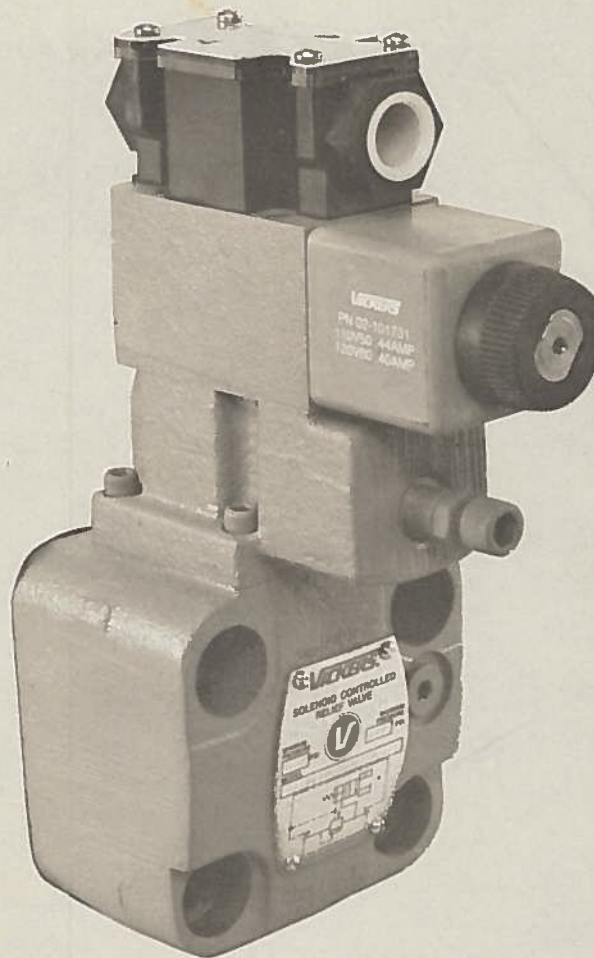


M2,5 x 11 (0.43) long collar screws supplied with panel for fixing



# Solenoid Controlled Pilot Operated Relief Valves

(F3)-C/G/S/T5-(H)-03/06\*\*\*(V)\*\*(V)-M-(S\*)\*\*\*\*\*-(L)\*\*\*\*\*-100/110-EN\*\*



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.

Released 06-01-91



**\* NOTE**

On CG5-(H)0\*\*\*C-\*(V)-100/110 dual solenoid models, pilot valve & cover S/A are rotated 90° clockwise from body. Refer to pilot valve drawing for parts breakdown.

\* Pilot Valve (See Table)  
(DG4V-3(S)-\*C-60 Shown)

▲ 232332 'O'Ring (4 Req'd)

▲ 263497 'O'Ring

■ 329463 Plug  
Torque 53-58 N.m.  
(39-43 lb. ft.)

■ 285601 Seat

Assemble 285601 seat with cross hole facing up as shown.

▲ 262361 'O'Ring

Inner Spring (See Table)

Outer Spring (See Table)

343154 Piston

Seat (See Table)

Sleeve ('H' High Flow Models Only)  
(See Table)

696892 Bolt Kit (Includes 4 Bolts)  
Torque 5.6 N.m. (50 lb. in.) Maximum

68905 Washer (4 Req'd)

1031 Screw (4 Req'd)  
Torque 14.5-20.4 N.m. (11-15 lb. ft.)

■ Cover (See Table)

■ 343704 Plug &  
▲ 263494 'O'Ring (See Table)

■ 398071 Plug &  
▲ 263492 'O'Ring (See Table)

⊕ ◆ 292230 Screw

■ 326317 Shim  
(As req'd to obtain proper adj. range)

■ 1485 Locknut

⊕ ◆ 283949 Retainer

■ 64520 Wt

■ 283948 Plunger

▲ 262332 'O'Ring

■ Washer (See Table)

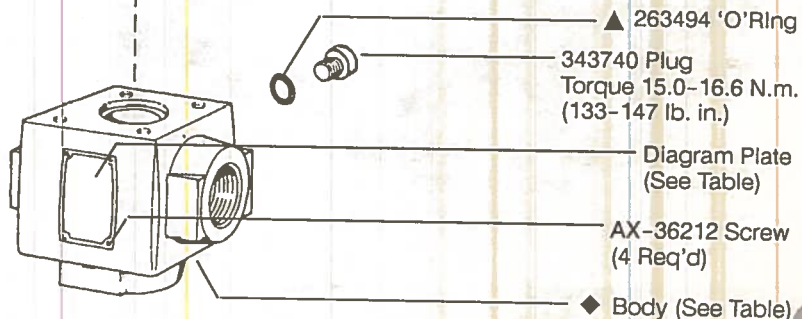
■ 422849 Spacer

■ Cover Spring  
(See Table)

■ 290057 Piston

MODEL	SEAT	SLEEVE
C*5-03/06	343153	—
C*5-H06	589473	589472

MODEL	■ COVER S/A
C*5-(H)0*0A/F-B(V)-100/110	942432
C*5-(H)0*0A/F-C(V)-100/110	942433
C*5-(H)0*0A/F-F(V)-100/110	942434
C*5-(H)0*1A-B(V)-100/110	942435
C*5-(H)0*2A-B(V)-100/110	
C*5-(H)0**C-B(V)-100/110	942436
C*5-(H)0*1A-C(V)-100/110	
C*5-(H)0*2A-C(V)-100/110	
C*5-(H)0**C-C(V)-100/110	942437
C*5-(H)0*1A-F(V)-100/110	
C*5-(H)0*2A-F(V)-100/110	
C*5-(H)0**C-F(V)-100/110	



▲ 263494 'O'Ring

343740 Plug  
Torque 15.0-16.6 N.m.  
(133-147 lb. in.)

Diagram Plate  
(See Table)

AX-36212 Screw  
(4 Req'd)

◆ Body (See Table)

MODEL	◆ BODY
CS5-03***-100/110	590407
CS5-(H)06***-100/110	581701
CT5-06***-100/110	590348





# Model Code

(F3)	-	C	*	5	-(H)	**	*	*	*	*	(V)	**	(V)	-	M	-(S*)	-	*	*	*	*	(L)	-	**	*	*	*	*	-	100/110	-	EN	**
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24										

**1** Seals for mineral oil & fire resistant fluids

**2** Relief valve

**3** Connections

G - Subplate mounting  
S - Straight threads  
T - NPTF threads

**4** Solenoid controlled

**5** High flow  
Omit for standard models

**6** Valve size

03 - 3/8"-.8750 straight thread  
06 - 3/4"-1.0625 straight thread  
or 3/4" NPTF

**7** Pilot spool function

0,1, or 2 Indicates venting condition

**8** Pilot spool spring arrangement

A - Spring offset  
C - Spring centered  
F - Spring centered, shift to center

**9** Pressure range

B - 125-1000 psi  
C - 500-2000 psi  
F - 1500-3000 psi

**10** High vent (Req'd for high flow models)

Blank - Omit for low vent models

**11** Manual override options (Included in pilot valve model code)

Blank - Plain override solenoid ends only  
H - Waterproof override solenoid ends only

H2 - Waterproof override both ends of single solenoid

M - Serviceable manual overrides in solenoid ends only

P2 - Plain override both ends of single solenoid

Y - Lockable manual overrides solenoid ends only

Z - No overrides in either end

**12** Solenoid energization identity

Blank - Standard arrangement for ANSI B93.9 (energise solenoid A for flow P to A port)

V - Solenoid identification determined by position of solenoid. (Solenoid A at port A end and/or solenoid B at port B end. (All 4 & 8 spools are always V code)

**13** Flag symbol heading electrical options & features

**14** Spool position monitoring switch (tank pressure rating 10 bar only)

S1 - Switch, normally open, U coils only

S2 - Switch, normally closed, U coils only

S3 - Switch, wired normally open, P\*

S4 - Switch, wired normally closed, P\*

S5 - Switch, free leads, FW & FJ only

**15** Coil type

U - ISO 4400

F - Flying lead

SP1 - Single 6,3 series spade to IEC 760

SP2 - Dual 6,3 series spade to IEC 760

**16** Electrical connections (F type coil only) omit if not required

T - Wired terminal block

PA - Instaplug male receptacle only

PB - Instaplug male & female receptacle

PA3 - Three pin connector

PA5 - Five pin connector

**17** Housing (F type coils only)

W - 1/2 NPT thread wiring housing

J - 20 mm thread wiring housing

**18** Electrical options

1 - ISO with fitted plug, U type coils only

6 - ISO with fitted plug, with lights, U type coils only

**19** Solenoid indicator lights (F build only) To be used with T terminal block models. (Omit if not required)

**20** Coil identification

**21** Pilot valve code (tank pressure rating)

2 - 10 bar (145 psi) use with switch models S\*

5 - 100 bar (1450 psi) DG4V-3S-60

6 - 160 bar (2300 psi) DG4V-3-60

7 - 210 bar (3000 psi) DG4V-3-60

**22** Pilot valve port orifices

**23** Design

100 - DG4V3S-60

Standard pilot valve

110 - DG4V3-60

High performance pilot valve

**24** Special modifications (omit if not required)

**11** Thru **22** included in pilot valve model code



MODEL	▲ SPRING
DG5S4-10-K	247287
DG5S4-10-R	276428
DG5S4-10-S	432353

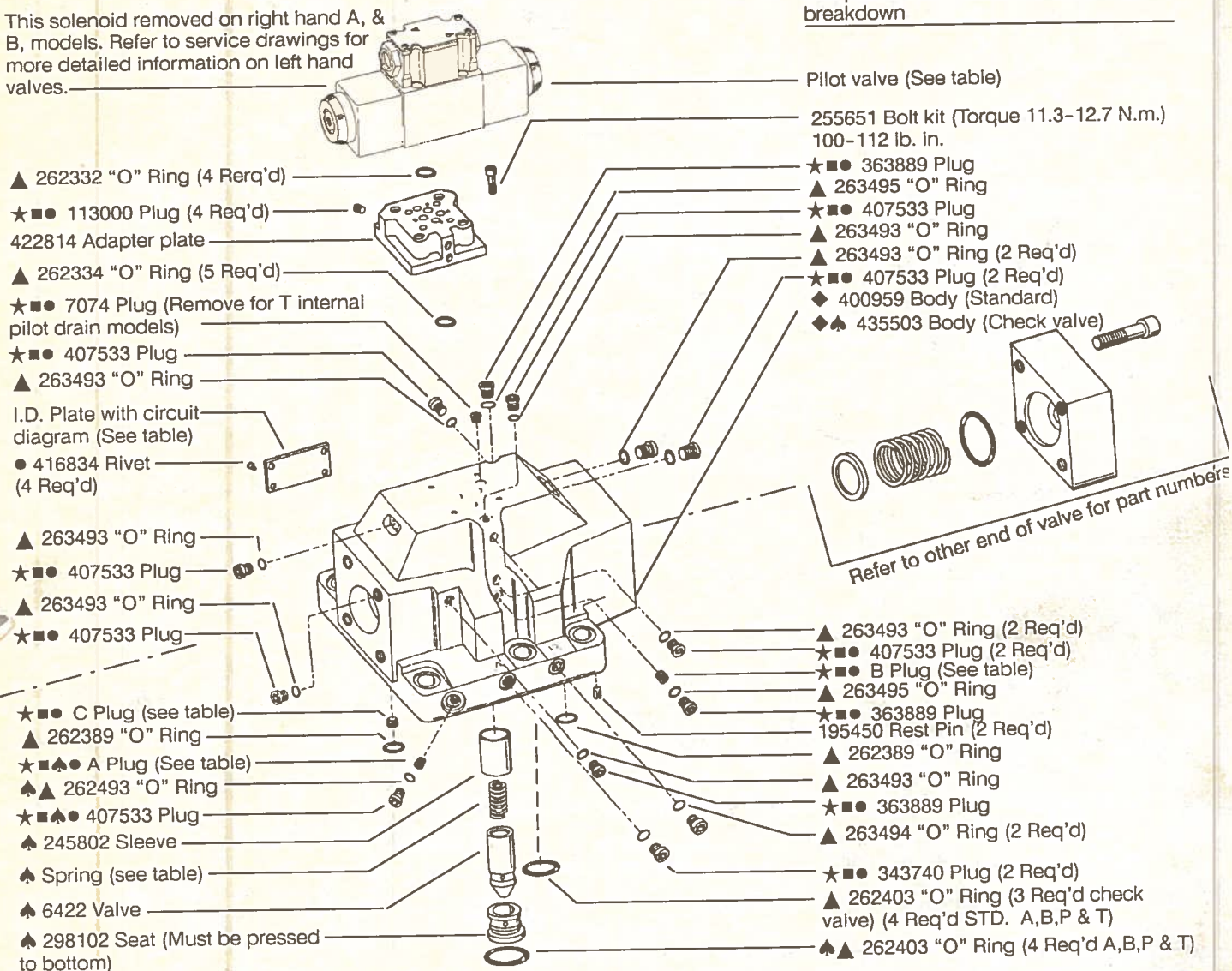
This solenoid removed on right hand A, & B, models. Refer to service drawings for more detailed information on left hand valves.

#### PILOT STAGE BOLT KIT (INCLUDES 4 ATTACHING BOLTS)

MODEL	BOLT KIT
W/O Pilot choke	696899
W/ Pilot choke	696900

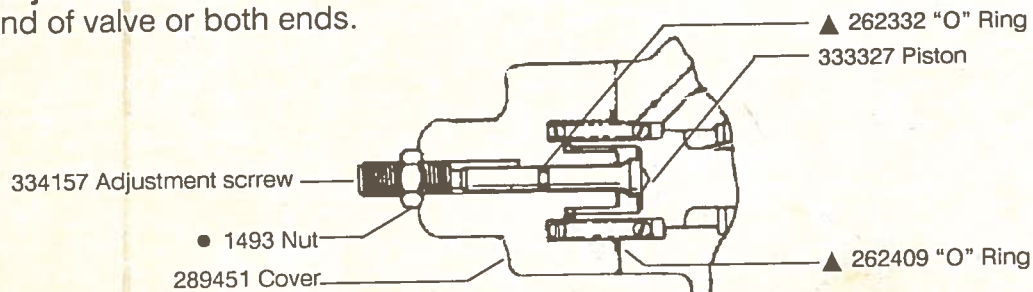
Torque 4.5-5.7 N. m. (40-50 lb. in.)

See pilot choke service drawing for parts breakdown



#### Stroke Adjustment Parts

(Either end of valve or both ends.)

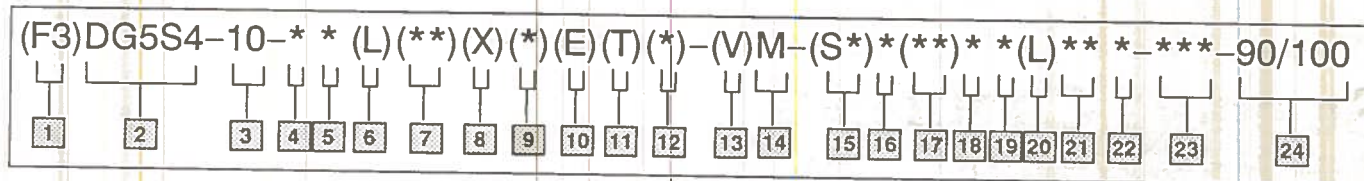


#### NOTE

For satisfactory service life of these components in industrial applications, use full flow filtration to provide fluid which meets ISO cleanliness code 18/15 or cleaner.



# Model Code



**1** Seals for mineral oil & fire resistant fluids

**2** Directional control valve  
Manifold or subplate mounted  
Solenoid controlled  
Pilot operated, Sliding spool  
4 way flow direction

**3** Interface (Valve size 1-1/4 inch)  
10 - NFPA-D10 (ISO-4401-10)

**4** Spool type (see table)

**5** Spool/Spring arrangement

A - Spring offset, to CYL. A  
B - Spring centered, sol. A removed  
C - Spring centered  
F - Spring offset, to CYL. A shift to center  
N - No spring detented

**6** Left hand

L - Left hand (single solenoid only)  
Blank - Omit when not required

**7** Manual override option

Blank - Plain override solenoid ends only  
H - Waterproof override solenoid ends only  
H2 - Waterproof override both ends of single solenoid  
P2 - Plain override both ends of single solenoid  
Y - Lockable manual overrides solenoid ends only/DC only  
Z - No overrides in either end

**8** Response type

X - Fast response  
Blank - Standard low shock models

**9** Spool control modifications

1 - Stroke adjustment  
2 - Pilot choke adjustment  
3 - Pilot choke & stroke adjustment  
7 - Stroke adjustment CYL. A only  
8 - Stroke adjustment CYL. B only  
2-7 - Dual pilot choke & stroke ADJ. A port end only  
2-8 - Dual pilot choke & stroke ADJ. B port end only  
Blank - Omit when not required

**10** Pilot pressure

E - External pilot pressure  
Omit - Internal pilot pressure

**11** Pilot drain

T - Internal pilot Drain  
Omit - External pilot drain

**12** Pressure port check valve

K - 0.35 bar (5 psi cracking pressure)  
R - 3.45 bar (50 psi cracking pressure)  
S - 5.20 bar (75 psi cracking pressure)  
Blank - Omit when not required

**13** Solenoid energization identity

Blank - Standard arrangement for ANSI B93.9 (energise solenoid A for flow P to A port)  
V - Solenoid identification determined by position of solenoid. (Solenoid A at port A end and/or solenoid B at port B end. (All 4 & 8 spools are always V code)

**14** Flag symbol heading electrical options & features

**15** Spool indicator switch

Available on high performance models, DG4V-3, only.  
Omit when not required.

S1 - Options available on U only  
S2 - Options available on U only  
S3 - Options available on P\* only  
S4 - Options available on P\* only  
S5 - Options available on FW/FJ only

**16** Coil type

U - ISO 4400  
F - Flying lead  
SP1 - Single 6,3 MM spade to IEC 760  
SP2 - Dual 6,3 MM spade to IEC 760

**17** Electrical connections (F type coil only) omit if not required

T - Wired terminal block  
PA - Instaplug male receptacle only  
PB - Instaplug male & female receptacle  
PA3 - Three pin connector  
PA5 - Five pin connector

**18** Housing (F type coils only)

W - 1/2 NPT thread wiring housing  
J - 20 mm thread wiring housing

**19** Electrical options

1 - ISO with fitted plug, U type coils only  
6 - ISO with fitted plug, & lights  
U type coils only

**20** Solenoid indicator lights (F build only) used with T terminal block models. (Omit if not required)

**21** Coil identification

**22** Pilot valve code (tank pressure rating)

2 - 10 bar (145 psi) DG4V3-60  
5 - 100 bar (1450 psi) DG4V3S-60  
6 - 160 bar (2285 psi) DG4V3-60  
7 - 210 bar (3000 psi) DG4V3-60

**23** Pilot valve port orifices

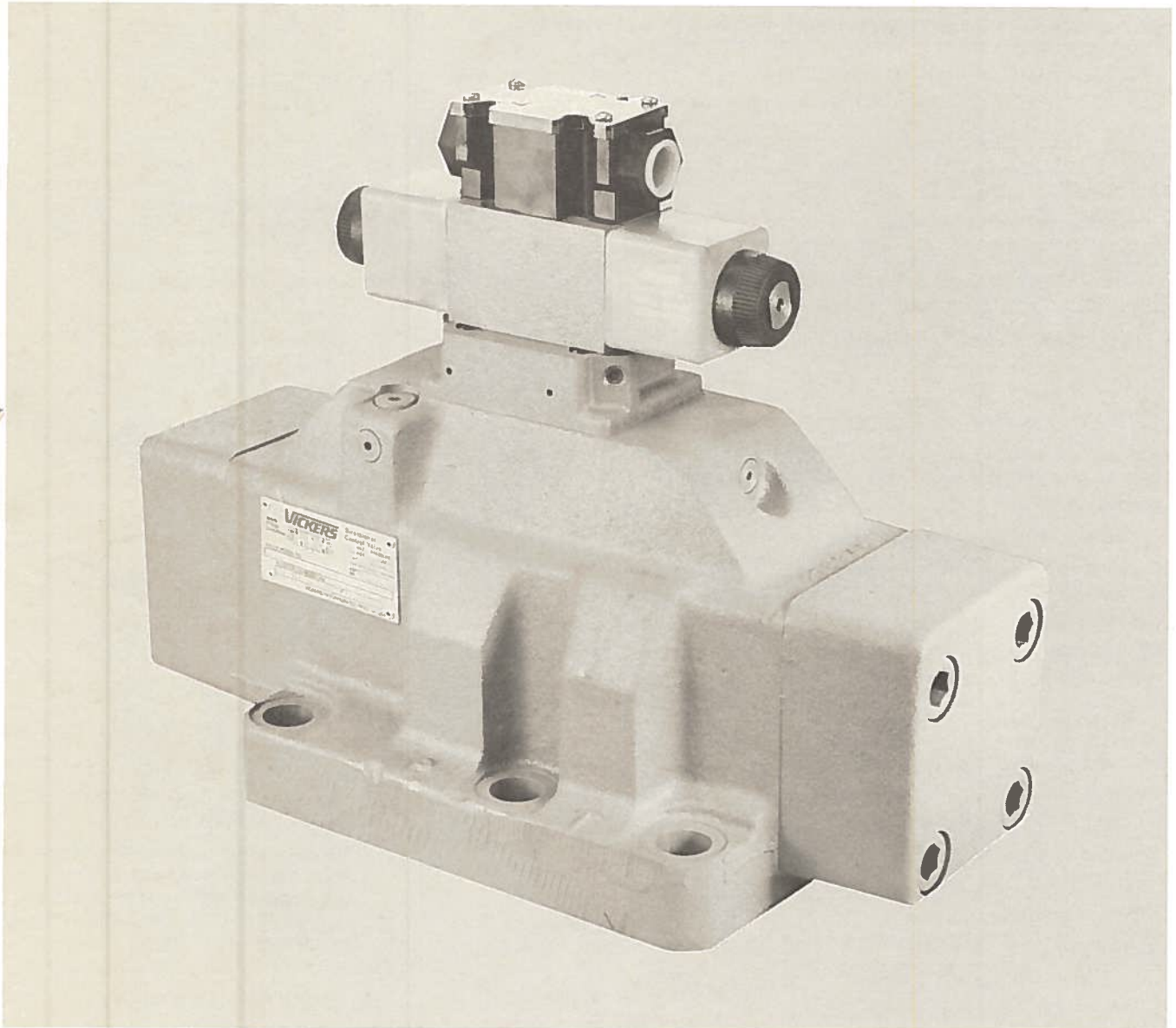
**24** Design

90 - DG4V3S-60 pilot valve  
100 - DG4V3-60 pilot valve

**6** Thru **23** included in pilot valve model code

# Solenoid Controlled Pilot Operated Directional Valves

(F3)DG5S4-10-\*\*(L)\*\*(X)(\*)(E)(T)(\*)-(V)M-(S\*)\*(\*\*)\*\*(L)\*\*\*-\*\*\*-90/100



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.



MAIN STAGE SPOOL TYPE	AVAILABLE VALVE TYPE	SPOOL	MAIN STAGE ID PLATE	
			"A" ONLY	B/C/N
O	A/B/C/N	364037	400975	400976
1		*331404		400977
2		364038		400978
3		*277479		400979
4		281193		400980
6		364039		400981
8		364041		400980
9		277563		400976
11		*331404		632700
31		*277479		580475
33		364042		400981

**\* SPOOL ASSEMBLY NOTE**

Assemble type 1 & 3 spools with narrow center land toward "A" end of valve. "A" end is defined as being closest to CYL. port "A". Type 11 & 31 spools are installed in reverse of type 1 & 3 with narrow center lands toward "B" end of valve.

**■ PLUG INSTALLATION TABLE**

MODEL	"A" PLUG	"B" PLUG	"C" PLUG
DG5S4-10*	DOES NOT EXIST	30560	—
DG5S4-10*-E		7074	30560
DG5S4-10*-X		—	—
DG5S4-10*-X-E		—	—
DG5S4-10*-K/R/S	161809	7074	—
DG5S4-10*-E-K/R/S	113000		30560
DG5S4-10*-X-K/R/S	—		—
DG5S4-10*-X-E-K/R/S	113000		—

107758 Washer (Remove on A offset models)

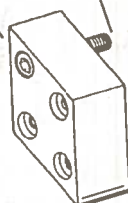
280931 Spring (Remove on A offset models)

▲ 262409 "O" Ring

□ 298168 Screw (4 Req'd)

Torque 205–230 N.m  
(150–170 lb.ft.)

276948 Cover



Spool (See table)



**■ PLUG TORQUES (OILED)**

PLUG	N.M	lb. in.
7074	8.5–9.6	75–85
30560	8.5–9.6	75–85
113000	5.0–5.9	45–52
161809	5.0–5.9	45–52
343740	15.0–16.0	133–147
363889	20.5–22.5	181–199
407533	12.1–12.4	107–110

**NOTE**

SAE straight thread plugs used on exterior of valve.

**NOTE**

Parts included in service kits are not sold separately.

**SEAL KIT NOTE**

Valves are manufactured as shown with F3 seals used internally. Interface seals are standard Nitrile material and are converted to F3 in the seal kit. All seals in the seal kit are F3.

VALVE CODE	MODEL	MAIN STAGE SPOOL TYPE	PILOT VALVE MODEL CODE
DG5S4-10*A		O, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3(S)-2A-60
		4 & 8	DG4V-3(S)-2AL-VM-60
DG5S4-10*B		O, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3(S)-6B-60
		4 & 8	DG4V-3(S)-6BL-VM-60
DG5S4-10*C		O, 1, 2, 3, 6, 9, 11, 31, 33, 52, 521	DG4V-3(S)-6C-60
		4 & 8	DG4V-3(S)-6C-VM-60
DG5S4-10*N		O, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3(S)-6N-60
		4 & 8	DG4V-3(S)-6N-VM-60

See pilot valve service drawing for parts breakdown

▲ Included In F3 Seal Kit 696898

★ Included In Plug Kit 941263

□ Included In Fastener Kit 941262

◆ Not Available For Sale

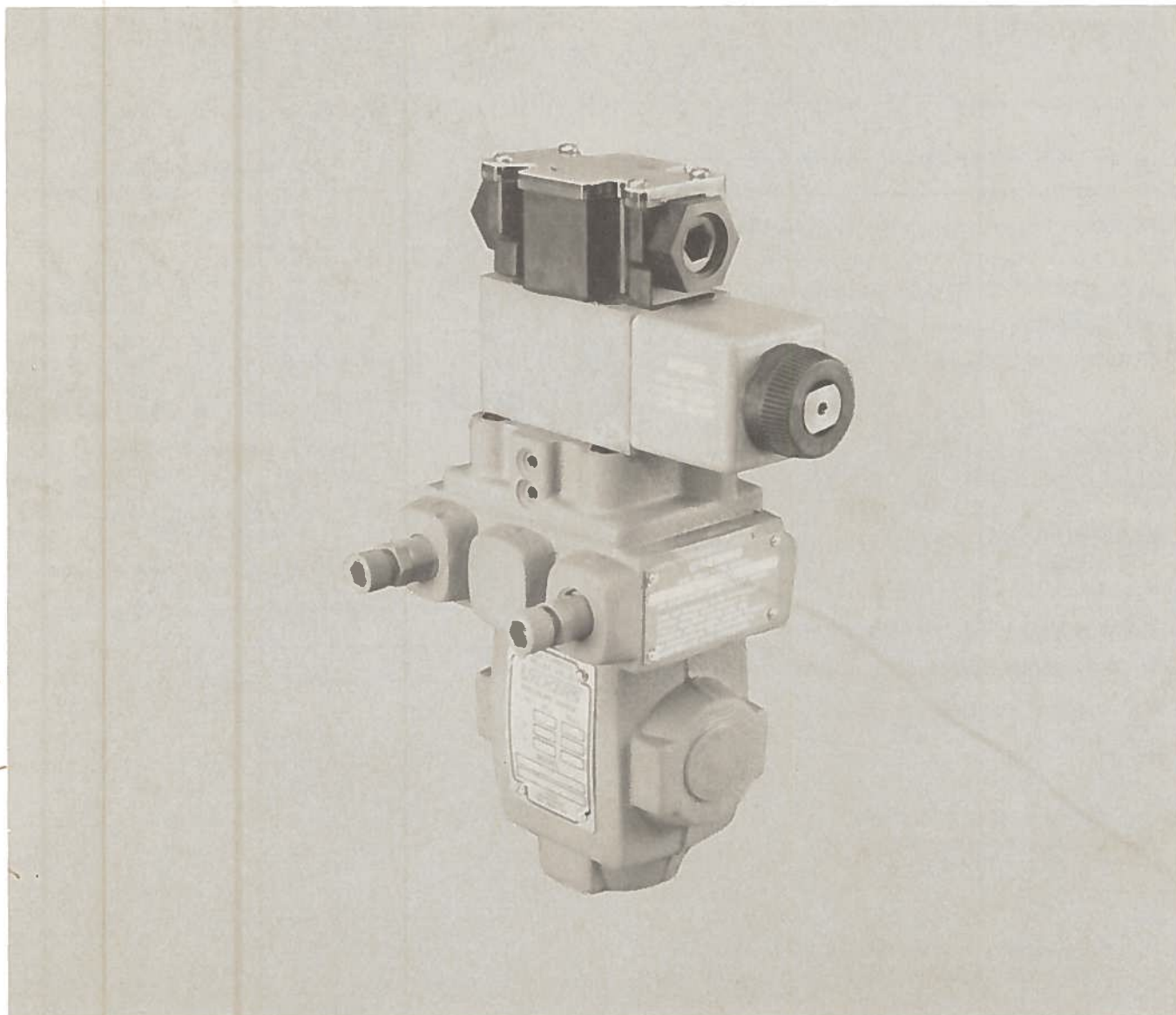
♠ Used On Check Valve Models Only

■ Plug Torques (See Table)

● Available Only In Kit Of 25 Each

## Multi-Pressure Relief Valves

(F3)-C/G/S/T-06/10\*\*(\*)(V)-DG-OA(L)\*\*-(V)M-(S\*)\*\*\*\*\* (L)\*\*\*\*\*-40/50



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.



NOTE: Lubricate all parts & seals with a thin coat of oil at assembly.

DG4V3(S)-OA(L)-60 Pilot valve (Refer to parts drawing for detailed information).

255698 Bolt kit (Torque 4.5-5.6 N.m.)  
40-50 lb.in. (Pilot valve to adapter plate mounting) Not shown

255651 Bolt kit (Torque 14.9-20.3 N.m.)  
11-15 lb.ft. (Adapter plate to cover mounting)

422814 Adapter plate

▲ 113000 Plug (4 Req'd)

△▲ 262334 "O"Ring (4 Req'd)

○● Cover (see table)

○● 290057 Piston (2 Req'd)

○● Cover spring (see table)

○●△▲ 262332 "O"Ring (2 Req'd)

○●△▲ 197570 BU-Ring (2 Req'd)

○● 370701 Plunger (2 Req'd)

○● \*▲ 292230 ADJ. screw  
(2 Req'd)

○● \*▲ 1485 Locknut (2 Req'd)

○● \*▲ 283949 Lockscrew (2 Req'd)

○● □▲ 64520 Washer (As req'd)

○● □▲ 326317 Washer (As req'd)

\* NOTE: Coat 292230 ADJ. screw,  
283949 lockscrew and 1485 locknut  
with oil prior to assembly.

□ NOTE: These parts used at final test  
to obtain correct pressure range.

# WARNING

Use only a DG4V3(S)-OA-60 or  
DG4V3(S)-OAL-60 directional  
valve as a pilot for this relief  
valve. Use of a different pilot  
can block relief valve, causing  
excessive system pressure.

○●△▲ 263497 "O"Ring (2 Req'd)

○●▲ 329463 Plug (3 Req'd)  
Torque 52.8-58.3 N.m.  
(39-43 lb. ft.)

○ 294656 Restrictor plug  
(2 Req'd) C\*-10 only

○● 285601 Seat (2 Req'd)  
Assemble cross hole  
facing up

▲ 226816 Rollpin

Lockwasher (see table)

Screw (see table)

▲ 113000 Plug  
● (C\*-06 5 Req'd)  
○ (C\*-10 7 Req'd)

○● 370839 Warning plate

○●▲ 227405 Screw (4 Req'd)

Hi-Vent spring (C\*-10) See table  
Lo-Vent spring (C\*-06/10) See table

Hi-Vent spring (C\*-06 only) See table

Hydrocone (see table)

Seat (see table)

△▲ 262361 "O"Ring (C\*-06)  
262367 "O"Ring (C\*-10)

# NOTE:

For satisfactory service life of these  
components in industrial applications,  
use full flow filtration to provide fluid  
which meets ISO cleanliness code  
18/15 or cleaner. OFP, OFR, and OFRS  
series filters are recommended.

Model	Seat	Hydrocone	Lo-Vent spring	Hi-Vent spring	Cover
C*-06	343153	343154	2077	184458	● 370666
C*-10	283954	283952	291822	291821	○ 370671

NOTE: Use either a Lo-Vent or Hi-Vent spring. Do not use both.  
(See model code)

# Contents

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# Model Code

## Pilot Operated Directional Valves



(F3) - DG5S4 - 04 - \* \* (L) - \*\* (X) - \* - E - T - \* - (V) M - S\* - \*\*\* \* (L) - \*\* \* - \*\*\* - 60/70

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

### 1 Special seals

F3 - For mineral oil and fire resistant fluids

Blank - Omit if not required

### 2 Directional control valve

Manifold or subplate mounting, solenoid controlled, pilot operated, sliding spool, rated pressure 207 bar (3000 psi)

### 3 Interface

04 - NFPA-D07 (ISO-4401-07)

### 4 Spool types

0, 2, 3, 4, 6, 8, 9, 31, 33

See models & graphic symbols table for description.

### 5 Spool/Spring arrangement

A - Spring offset

B - Spring centered with solenoid "A" removed

C - Spring centered

F - Shift to center from offset (single solenoid)

N - No-spring detented (pilot only)

### 6 Left-Hand assembly

L - Single solenoid models only. Omit for right-hand assembly. (For right-hand assembly P to A when solenoid 'a' is energized.)

### 7 Manual override options

Blank - Plain override solenoid end only

H - Waterproof override solenoid ends only

H2 - Waterproof override both ends of single solenoid

P2 - Plain override both ends of single solenoid.

Y - Lockable manual overrides solenoid ends only/DC only

Z - No overrides in either end

### 8 Response type

X - Fast response

Blank - Standard low shock models

### 9 Spool control modifications

1 - Stroke adjustments, both ends

2 - Pilot choke (dual) adjustments

3 - Pilot choke and stroke adjustments

7 - Stroke adjustment "A" port end only

8 - Stroke adjustment "B" port end only

2-7 - Dual pilot choke & stroke adjustment "A" port end only

2-8 - Dual pilot choke & stroke adjustment "B" port end only

Blank - Omit if not required

### 10 Pilot pressure

E - External pilot pressure

Blank - Internal pilot pressure

### 11 Pilot drain

T - Internal pilot drain

Blank - External pilot drain

### 12 Pressure port check valve

K - 0,35 bar (5 psi) cracking pressure

R - 3,4 bar (50 psi) cracking pressure

S - 5,2 bar (75 psi) cracking pressure

Blank - Omit if not required

### 13 Solenoid energization identity

V - Solenoid identification determined by position of solenoid (solenoid "A" at port "A" end and/or solenoid "B" at port "B" end)

Blank - Standard arrangement for ANSI B93.9 (energize solenoid "A" for flow P to A port)

(Code V for any valve with code 4 or code 8 spool)

### 14 Flag symbol

M - Electrical options and features

### 15 Spool indicator switch

(Available on models with high performance pilot DG4V3 only)

S3 - Normally open (available on valves with code P\* only)

S4 - Normally closed (available on valves with code P\* only)

S5 - Free leads (available on valves with coil type code F only)

S6 - LVDT type DC switch with Pg7 connector plug

### 16 Coil type

U - ISO 4400

F - Flying lead

SP1 - Single 6,3 mm spade to IEC 760

SP2 - Dual 6,3 mm spade to IEC 760

### 17 Electrical connections

(Code F coil only)

T - Wired terminal block

PA - Insta-plug male receptacle only

PB - Insta-plug male & female receptacle

PA3 - NFPA 3-pin connector

PA5 - NFPA 5-pin connector

Blank - Omit if not required

### 18 Housing

(Code F coil only)

W - 1/2 NPT thread wiring housing

J - 20 mm thread wiring housing

Blank - Omit if not required

### 19 Solenoid indicator lights

(Code F coil w/Code T electrical connections only)

L - Indicator lights

Blank - Omit if not required

**[20] Coil identification**

A - 110V/50 Hz  
B - 110V/50 Hz, 120V/60 Hz  
C - 220V/50 Hz  
D - 230V/50 Hz, 240V/60 Hz  
G - 12V DC  
H - 24V DC  
DJ - 98V DC  
P - 110V DC

**[21] Pilot valve tank pressure rating**

2 - 10 bar (145 psi) DG4V3-60 with S3, S4, or S5 spool indicator switch  
4 - 70 bar (1000 psi) hazardous model  
5 - 100 bar (1450 psi) DG4V3S-60  
6 - 160 bar (2285 psi) DG4V3-60 with AC solenoids and optional S6 spool indicator switch  
6 - 207 bar (3000 psi) DG4V3-60 with DC solenoids and optional S6 spool indicator switch

**[22] Pilot valve port orifices**

Code	Orifice Diameter
*00 -	Solid plug
*03 -	0,30 mm (0.012 in)
*06 -	0,60 mm (0.024 in)
*08 -	0,80 mm (0.030 in)
*10 -	1,00 mm (0.040 in)
*13 -	1,30 mm (0.050 in)
*15 -	1,50 mm (0.060 in)
*20 -	2,00 mm (0.080 in)
*23 -	2,30 mm (0.090 in)

Blank - Omit if not required  
(\* = P, T, A, and/or B as required)

**[23] Design number**

Subject to change. Installation dimensions remain as shown for designs 60 through 69 and 70 through 79.  
60 - DG4V3S-60 pilot valve  
70 - DG4V3-60 pilot valve

For more information on the pilot control valve, refer to Vickers literature #GB-C-2015B, *Solenoid Operated Directional Control Valves*.





# General Information

## Basic Characteristics

Max. pressure: 207 bar (3000 psi)  
Max. flow: ..... 227 l/min (60 USgpm)  
Max. pressure port T (external drain):  
..... 207 bar (3000 psi)  
Max. pressure port T (internal drain):  
DG4V-3S ..... 100 bar (1450 psi)  
DG4V-3 ..... 207 bar (3000 psi)  
Max. pilot pressure:  
..... 207 bar (3000 psi)  
Weights - See installation drawings.  
Fluid Cleanliness - See page 16.

## Mounting Interface

ISO-4401-07  
NFPA D07

## Shifting Action

Spring centered, pressure centered and spring offset models must be energized continuously to maintain the shifted position. Detented no-spring models may be energized momentarily (approximately 0.1 second).

Pressure centered and spring centered models return valve spool to center position when solenoids are de-energized.

Spring offset models return spool to offset position by pilot pressure when solenoid is de-energized.

When no-spring detented models are de-energized, the pilot and main spools remain in the last position attained, provided there is no shock, vibration, unusual pressure transients and the spool axis is horizontal. If pilot pressure fails or falls below the minimum, the main spool will spring center (at spring centered flow rates) and cannot drift to reverse flow (pilot stage remains in detented position).

## CAUTION

Surges of oil in a common tank line serving these and other valves can be of sufficient magnitude to cause inadvertent shifting of these valves. This is particularly critical in the no-spring detented type valves. Separate tank lines or a vented manifold with a continuous downward path to tank is necessary. (This also applies to connection X on spring offset valves, if X is piped as a drain.)

## NOTE

Any sliding spool valve, if held for long periods of time, may stick and not spring return due to fluid residue formation and therefore, should be cycled periodically to prevent this from happening.

When used as other than a normal 4-way valve, consult your Vickers representative.

## Mounting Position

No-spring detented valves must be installed with the longitudinal axis horizontal for good machine reliability. The mounting position of spring offset models is unrestricted provided that the pilot pressure supply is maintained as required. (Spring offset valves do not have a spring in the main spool section.)

## Application

All spools at zero flow require 5,2 bar (75 psi) minimum pilot pressure. At maximum flow without malfunction 5,5 bar (80 psi) is required for open center spools (types 0, 4, 8 & 9) and 8,6 bar (125 psi) is required for closed center spools (types 2, 3, 6, 31 & 33).

## NOTE

The pilot pressure stated is based on internally piloted and externally drained models in which the pilot pressure is equal to the pressure at the valve pressure port. With models having pressure open or partially open to tank at center position, pilot pressure can be assured by imposing a back pressure of at least the required minimum pilot pressure at the tank outlet connection (this back pressure will be present at cylinder ports if spool is "0" or "9" type). When pilot pressure from separate source (external) is required, an external connection can be provided. Order according to model code.

## Installation Data

### Pilot Valve Drain

Internal: To provide maximum flow without malfunction, pilot pressure of internally drained valves must always exceed tank line back pressure by a minimum of 5,2 bar (75 psi) for spool types 0, 4, 8 & 9 and a minimum of 10,3 bar (150 psi) for all other spools.

Internal drain may be used with all valves, however, an integral pressure port check valve (ref. integral check valve on page 5) is required for valves using an internal pilot source with an open center spool (0, 4, 8 and 9 types) in order to maintain pilot pressure. If an external pilot source is used, an integral check is not required. When internal pilot drain is required, order according to model code. (Pressure centered valves not included.)

External: When the possibility of pressure surges in the tank line exists, externally drained valves are recommended. For externally drained models, the pilot valve drain line must be piped directly to tank through a surge free line so there will be no back pressure at this drain. (Reference connection "Y".)



### Pressure Centered Drain

(external only)

The external pilot drain explanation on the previous page applies to "Y" drain port. Pressure centered "W" drain connection must be piped directly to tank through a surge free line so there will be no back pressure at this drain.

### Optional Features

#### Integral Check Valve

For open center spools - When using internal pilot pressure and internal pilot drain, select appropriate check spring model (K, R or S) from "Pressure Drop Across Check Valve" curve on page 8. Total pressure drop required is 5,2 bar (75 psi), (see pilot pressure ratings and note) therefore, determine valve  $\Delta P$  (P to T) at the actual application flow rate. Subtract this value from 5,2 bar (75 psi) and call its value "C". Refer to the check valve pressure drop curve at the application flow rate and select the spring model letter whose curve is above this pressure (bar/psi) value "C".

### Fast Response

Use of this option decreases shift time approximately 60%. However, system shock generation is correspondingly increased. The fast response option is not recommended for pilot pressure exceeding 138 bar (2000 psi).

### Service Information

Refer to specific Vickers parts drawing for service parts information. A complete parts breakdown is contained in this drawing.

Order by literature number.

DG5S4-04-60/70 ..... I-3891-S



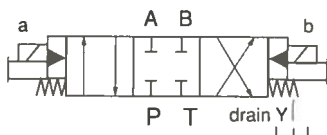
**Typical shift times in milliseconds for spring centered valves at rated flow and pressure.**  
(See note on fast response option.)

Port Condition	P to A or B				A or B to P
Pilot Pressure	80 ms	125 ms	500 ms	>1000 ms	Spring return
Open Center Spools	180 ms*	130 ms	65 ms	50 ms	50 ms
Closed Center Spools	N/A	125 ms*	65 ms	50 ms	50 ms

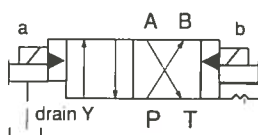
\* Minimum pilot pressure

### Functional Symbols

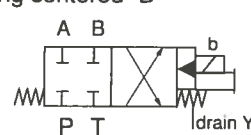
Double Solenoid -  
Spring centered "C"



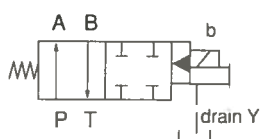
Double Solenoid -  
No-spring, detented "N"



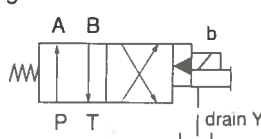
Single Solenoid -  
Spring centered "B"



Single Solenoid -  
Shift to center "F"



Single Solenoid -  
Spring offset "A"



# Models & Graphical Symbols

Shift to Center -F*-	Spring Centered -C*-	Spring Offset -A-	Pressure Centered -B-	No-Spring Detented -N-		
All Spools	All Spools	0, 2, 6, 9 & 33	All Spools	0, 2, 6, 9 & 33	Center Position & Spool Type	Description Center Position
DG5S4-040F	DG5S4-040C	DG5S4-040A	DG5S4-040B	DG5S4-040N	"0"	Opens to T all ports
DG5S4-042F	DG5S4-042C	DG5S4-042A	DG5S4-042B	DG5S4-042N	"2"	Closed to T all ports
DG5S4-043F	DG5S4-043C		DG5S4-043B		"3"	Closed P & B open A to T
DG5S4-044F	DG5S4-044C		DG5S4-044B		"4"	Tandem P to T closed crossover
DG5S4-046F	DG5S4-046C	DG5S4-046A	DG5S4-046B	DG5S4-046N	"6"	Closed P only open A & B to T
DG5S4-048F	DG5S4-048C		DG5S4-048B		"8"	Tandem P to T open crossover
DG5S4-049F	DG5S4-049C 40-S327 ▲	DG5S4-049A	DG5S4-049B	DG5S4-049N 50-S327 ▲	"9"	Open to T all ports over tapers
DG5S4-0431F	DG5S4-0431C		DG5S4-0431B		"31"	Closed P & A open B to T
DG5S4-0433F	DG5S4-0433C	DG5S4-0433A	DG5S4-0433B	DG5S4-0433N	"33"	Closed P open A & B to T over tapers

\* 4 & 8 type spools - offset position flow paths reversed.

■ 4 & 8 type spools - flow paths reversed.









▲ Maximum flow limited to 170 l/min (45 USgpm) @ 69 bar (1000 psi), 76 l/min (20 USgpm) or 45 l/min (12 USgpm) @ 207 bar (3000 psi).

→ Full flow

⇄ Restricted flow



# Pressure Drop

		Pressure Drop bar (psi) @95 l/min (25 USgpm)				
Spool Type & Center Position	Description	P → A	B → T	P → B	A → T	P → T on Center
"0" 	Open center all ports	1,72 (25)	2,76 (40)	1,72 (25)	1,72 (25)	2,76 (40)
"2" 	Closed center all ports	2,41 (35)	3,10 (45)	2,41 (35)	2,41 (35)	—
"3" 	Closed P & B A open to T	2,41 (35)	3,10 (45)	2,41 (35)	1,72 (25)	—
"4" 	Tandem - closed crossover	4,83 (70)	5,86 (85)	4,83 (70)	5,86 (85)	5,17 (75)
"6" 	Closed center P only	2,41 (35)	3,10 (40)	2,41 (35)	1,72 (25)	—
"8" 	Tandem - open crossover	2,41 (35)	4,14 (60)	2,41 (35)	3,45 (50)	4,14 (60)
"9" 	Open center partial - all ports	1,72 (25)	3,10 (40)	1,72 (25)	1,72 (25)	—
"33" 	Closed center bleed A & B	2,41 (35)	3,10 (45)	2,41 (35)	2,41 (35)	—

## Note

When solenoid "a" is energized, flow is always P to A. When solenoid "b" is energized, flow is always P to B. This is in accordance with the ANSI-B93.9 standard. Standard spring offset valves are assembled right hand, such that flow is P to A in the spring offset position (solenoid is de-energized). Solenoid "a" and "b" are identified on the diagram plate.

- Figures in the pressure drop table give approximate pressure drop ( $\Delta P$ ) when passing 95 l/min (25 USgpm) flow (Q) of 21 cSt (100 SUS) fluid(s) having .865 specific gravity.
- For any other flow rate ( $Q_1$ ), the pressure drop ( $\Delta P_1$ ) will be approximately:  $\Delta P_1 = \Delta P(Q_1/Q)^2$
- For any other viscosity(s), the pressure drop ( $\Delta P$ ), will change as follows:

Viscosity								
cSt	14	32	43	54	65	76	86	
(SUS)	(75)	(150)	(200)	(250)	(300)	(350)	(400)	
% of $\Delta P$ (Approx.)	93	111	119	126	132	137	141	

- For any other specific gravity ( $G_1$ )\*, the pressure drop ( $\Delta P_1$ ) will be approximately:  $\Delta P_1 = \Delta P(G_1/G)$

\* Specific gravity of fluid may be obtained from its producer. The value is higher for fire-resistant fluids than for oil.

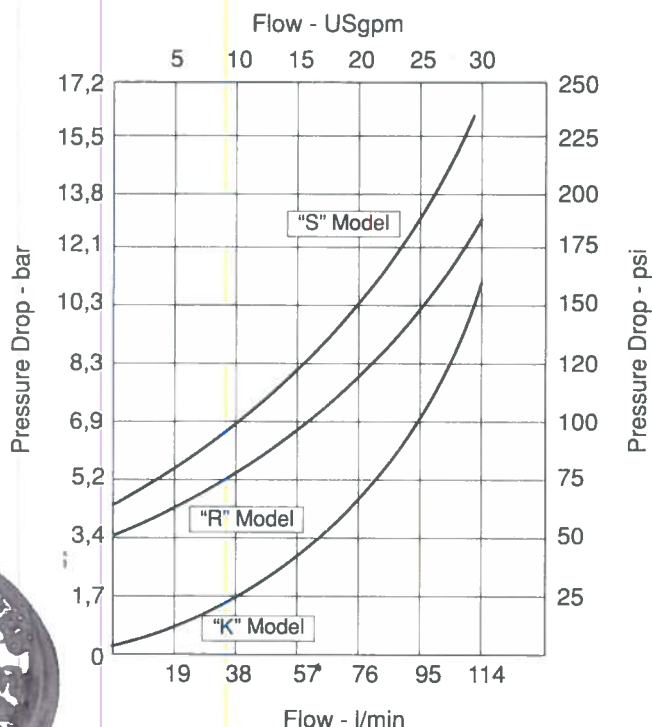




## Pressure Drop Across Check Valve

Total pressure drop is determined from the pressure drop induced by check valve and other sources. (See graph, pilot pressure and integral valve notes.) Total must be greater than minimum bar/psi for good machine reliability.

To determine check valve cracking pressure needed to provide pilot pressure, calculate total pressure drop through valve (P to T) on center at minimum flow. Total pressure drop is determined from pressure drop chart for standard valve and adding pressure drop induced by check valve (see graph). Total must be greater than the minimum for good machine reliability. (See pilot pressure and integral check valve notes.)



## Flow Ratings

Valve Type	Spool Type	Pressure bar (psi)	Recommended Flow Capacity l/min (USgpm)	Maximum Flow without Malfunction l/min (USgpm)
Spring Centered & Shift to Center	2, 3, 6, 31, 33	207 (3000)	95 (25)	227 (60)*
	0	207 (3000)	95 (25)	114 (30)
	4, 8†	207 (3000)	45 (12)	45 (12)
		138 (2000)	76 (20)	76 (20)
		69 (1000)	95 (25)	114 (30)
Spring Offset	0, 2	207 (3000)	95 (25)	227 (60)*
	6	207 (3000)	95 (25)	227 (60)*
	9	207 (3000)	95 (25)	227 (60)*
No-Spring	0, 2, 6, 9 ■	207 (3000)	95 (25)	227 (60)* ■

\* As system flow increases the minimum pilot pressure required increases. These spools will operate satisfactorily in excess of 227 l/min (60 USgpm) with higher pilot pressures.

■ Maximum flow limited to 170 l/min (45 USgpm) @ 69 bar (1000 psi), 76 l/min (20 USgpm) or 45 l/min (12 USgpm) @ 207 bar (3000 psi).

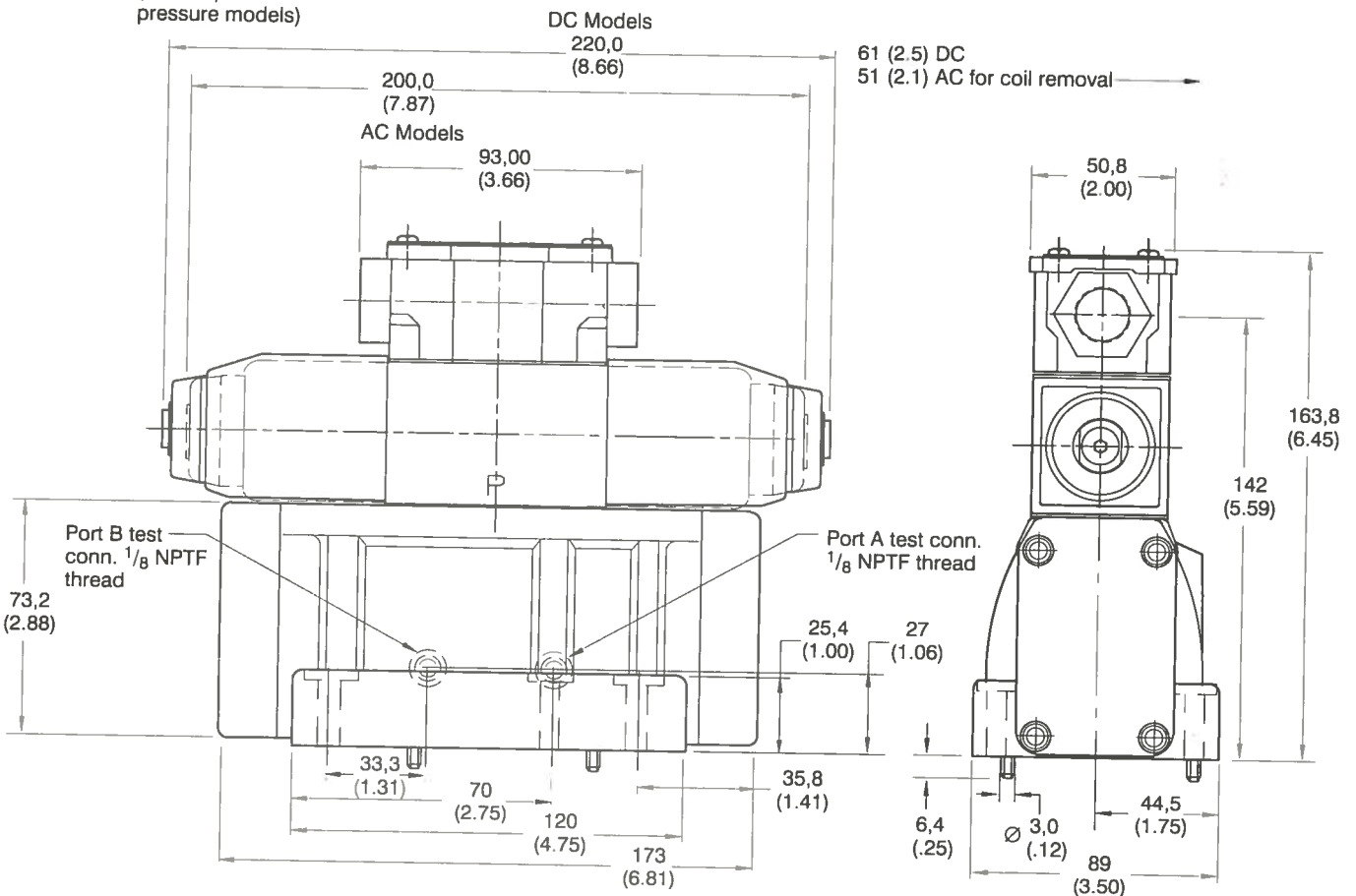
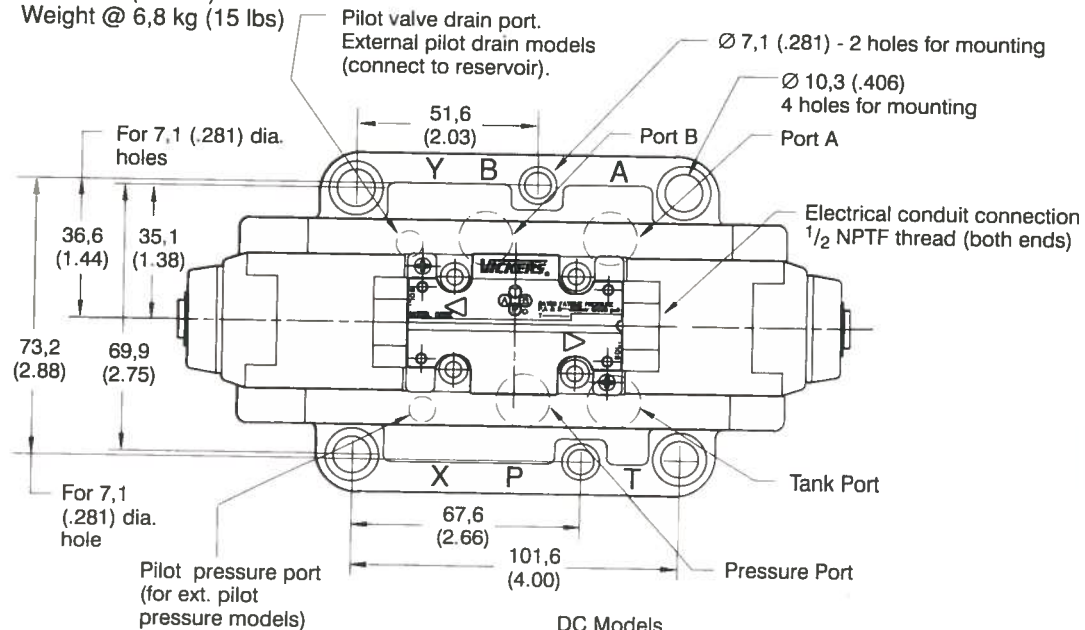
† Fast valve switching of large oil volumes, without adequate decompression circuitry, can develop instantaneous flows well above the maximum ratings. The type 8 spool may spin within the body, causing unusual valve body bore wear when applied in this type of circuit. With this and other spool types, valve malfunction might occur.

# Installation Dimensions

## Double Solenoid, Spring Centered & No-Spring Detented Types

Millimeter (inches)

Weight @ 6,8 kg (15 lbs)



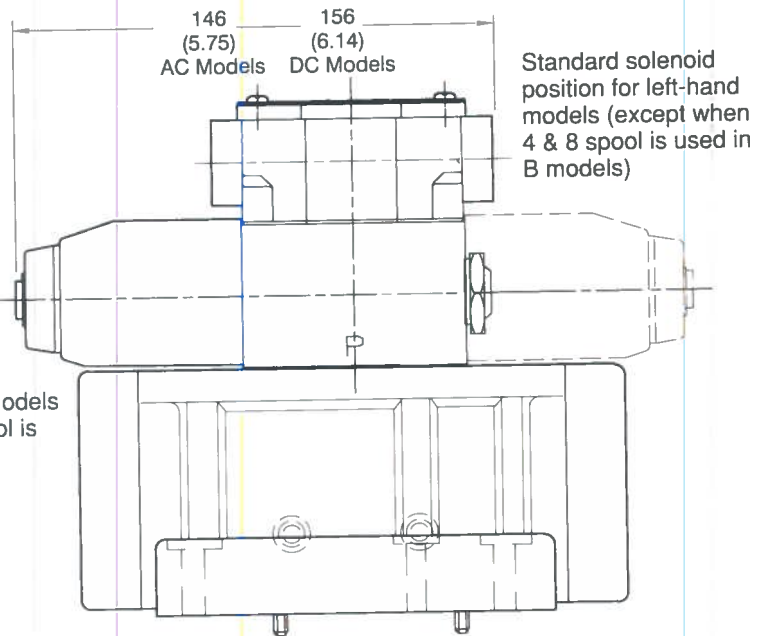
## Single Solenoid - Spring Offset, Spring Centered & Shift-to-Center

Millimeter (inches)  
Weight @ 6,4 kg (14 lbs)



Right-hand assembly shown

Standard solenoid  
position for right-hand models  
(except when 4 & 8 spool is  
used in B models)



## Pilot Choke and Stroke Adjustments

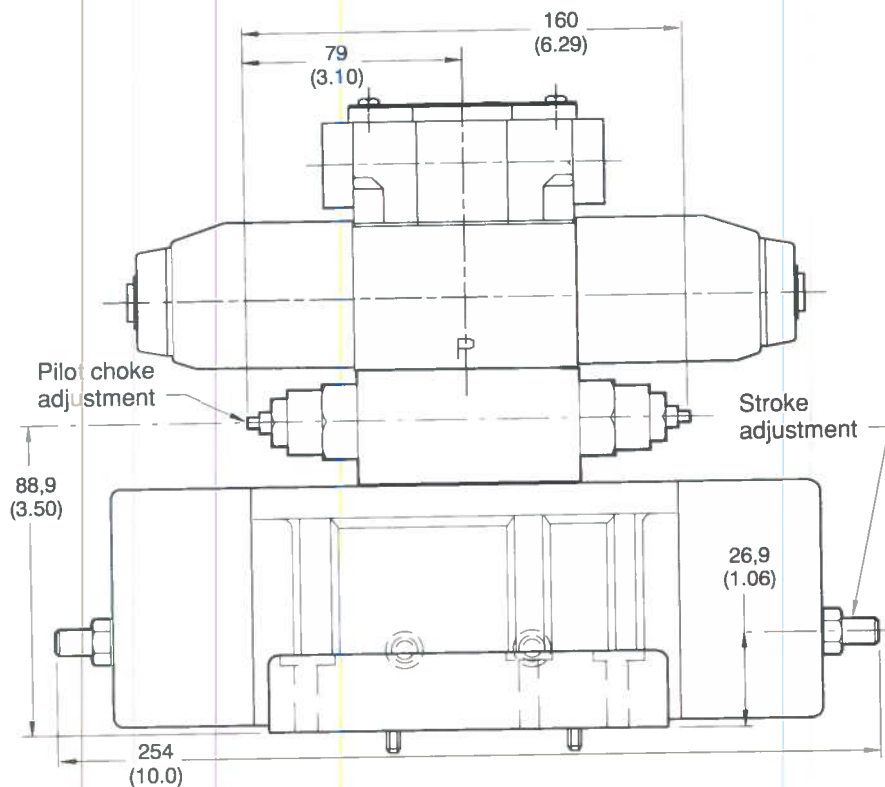
### Pilot Choke Adjustment(s)

Pilot choke is adjusted by backing off locknuts and turning adjusting screws inward (clockwise) to decrease rate of spool travel and outward (counterclockwise) to increase the rate. Pilot oil for models with this feature should be taken from a source having a constant pressure. See spool control modifications in model code.

### Stroke Adjustment(s)

Stroke adjustment limits movement of the main stage spool. Backing off the jam nut and turning the adjusting screw inward (clockwise) decreases spool stroke. See spool control modifications in model code.

Weights: Dual pilot - 8,6 kg (19 lbs)  
1 Stroke adj. - 6,9 kg (15.3 lbs)  
2 Stroke adj. - 7 kg (15.5 lbs)  
Pilot choke & Stroke adj. -  
8,8 kg (19.5 lbs)





# Subplates & Bolt Kits

Valves, subplates and mounting bolts must be ordered separately.

Example:

One (1) DG5S4-040A-M-W-\*\*-\*\* Valve

One (1) DGSM-04-12S-20 Subplate

One (1) BKDG-04-650 Bolt Kit †

† Maximum recommended bolt torque  
1/4" screws - length 1.50" - 12,7 Nm  
(112 in. lbs.)

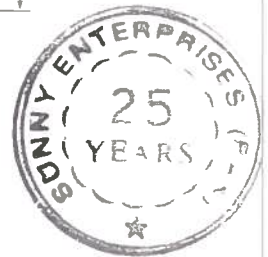
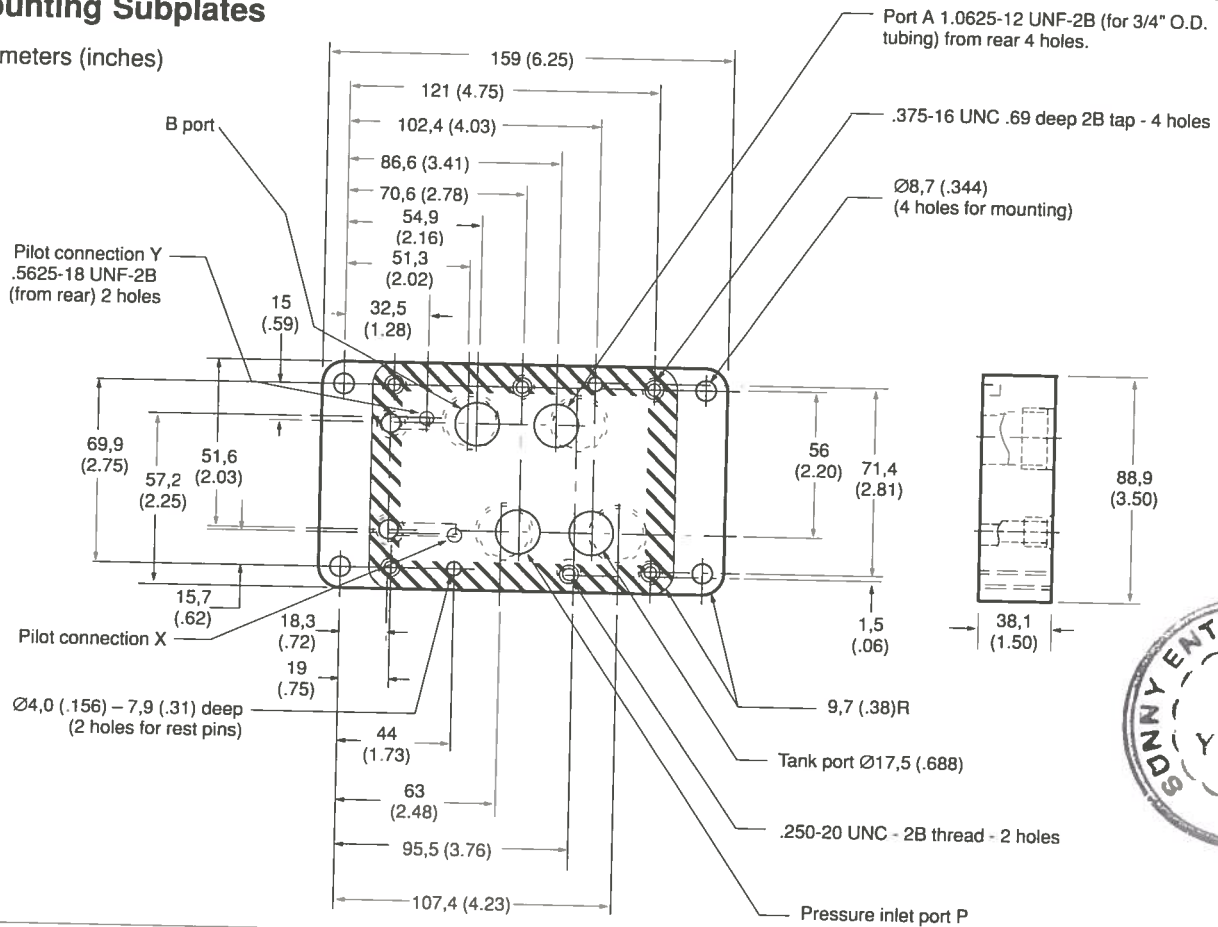
3/8" screws - length 1.75" - 35,6 Nm  
(315 in. lbs.)

Weight: @ 3,2 kg (7 lbs)

When subplate is not used, a machined pad (as indicated by subplate shaded area, below) must be provided for mounting. Pad must be flat within 0,0127 mm (.0005 inch) and smooth within 1,6 µm (63 microinch). Mounting bolts, when provided by customer, should be SAE grade 7 or better.

## Mounting Subplates

Millimeters (inches)



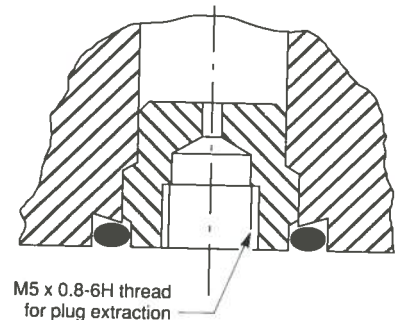
## Pilot Valve Port Restrictor Plugs

Restrictor plugs are available for use in ports P, T, A, or B. These can be used for restricting flow or for circuit dampening. Restrictor plugs are not recommended for use above 207 bar (3000 psi) system pressure.

Part Number†	Orifice Ø	Model Code
694353	Blank	*00
694341	0,30 (0.012)	*03
694342	0,60 (0.024)	*06
694343	0,80 (0.030)	*08
694344	1,00 (0.040)	*10
694345	1,30 (0.050)	*13
694346	1,50 (0.060)	*15
694347	2,00 (0.080)	*20
694348	2,30 (0.090)	*23

† - Available in multiples of 25 per part number

\* - P, T, A, or B as required



# Electrical Information

## Solenoids

On all models when solenoid A is energized, flow is always P to A. When solenoid B is energized, flow is always P to B. This is in accordance with the ANSI-B93.9 standard. Solenoid A and B are identified on the main plate on the top of the valves terminal box. Single solenoid models can be assembled left-hand (flow is P to B when solenoid A is energized).

## Solenoid Energizing

Spring centered and spring offset types will be spring positioned unless solenoid is energized continuously. No-spring detented valves may be energized momentarily, approximately 0.1 second; when solenoid is de-energized spool will remain in last position attained provided there is no shock, vibration, or unusual pressure transients.

## Electrical Connection


A 1/2" NPTF thread connection is provided on both ends of the terminal box. This connection will readily accept common electrical quick disconnect assemblies on the market. The wiring housing is available with most options.

## Solenoid Indicator Lights

Light is "on" when there is current at the solenoid coil. Lights are available for various voltages in both AC and DC service.

## Pilot Valve Operating Data

Standard Performance Valve DG4V-3S-*-60		High Performance Valve DG4V-3-*-60	
Electrical Protection			
ISO 4400 coils w/plug	IEC 144 class IP65	IEC 144 class IP65	
Conduit box	IEC 144 class IP65	IEC 144 class IP65	
Vickers Insta-Plug	IEC 144 class IP50	IEC 144 class IP50	
Coil Winding	Class H	Class H	
Lead wires (coil type F)	Class H	Class H	
Coil encapsulation	Class F	Class F	
Typical response times at 100% rated volts measured from application/removal of voltage to full spool displacement of 2C spool at:			
Flow rate P to A, B to T	20 l/min (5.3 USgpm)	40 l/min (10.6 USgpm)	
Pressure	175 bar (2538 psi)	175 bar (2538 psi)	
AC energizing	18 ms	15 ms	
AC de-energizing	32 ms	23 ms	
DC energizing	60 ms	45 ms	
DC de-energizing	40 ms	28 ms	
Power consumption, AC solenoids	Initial ♦ VA (RMS)	Holding VA (RMS)	Initial ♦ VA (RMS) Holding VA (RMS)
Full power coils:			
Single frequency coils AC 50 Hz	225	39	225 54
Dual frequency coils at 50 Hz	265	49	280 61
Dual frequency coils at 60 Hz	260	48	300 58
Low power coils, "B" & "D":			
Dual frequency coils at 50 Hz	Low power coils not usable with		170 37
Dual frequency coils at 60 Hz	DG4V-3S valves.		190 37
Power consumption, DC solenoids			
Full power coils:			
12V, model type "G"	30W	—	30W —
24V, model type "H"	30W	—	30W —
Low power coils, "B" & "D":			
12V, model code "G"	Low power coils not usable with		18W —
24V, model code "H"	DG4V-3S valves.		18W —





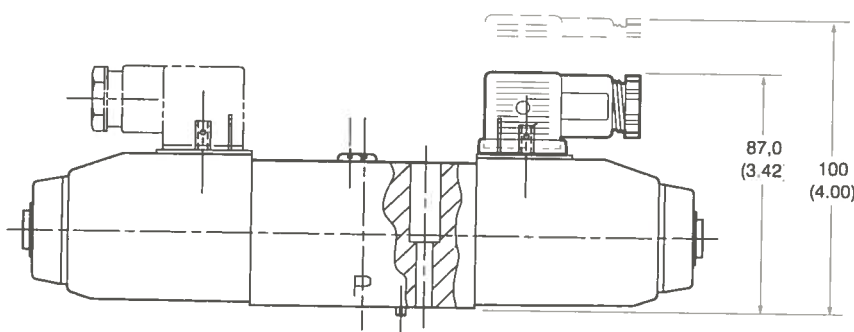
♦ First half cycle; armature fully retracted.

# Electrical Connectors

## DIN Standard 43650 Plug-in Connectors

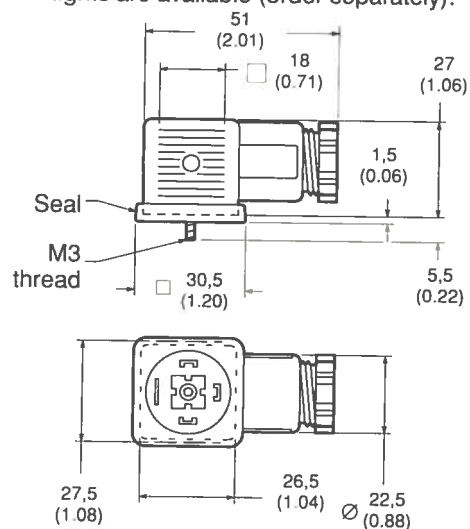
**Plug connector**  
(Order separately)  
(ISO4400/DIN 43650)

Cable diameter range: Ø6–10 mm (0.24–0.40)  
Wire section range: Ø,5–1,5 mm<sup>2</sup> (0.0008–0.0023 in<sup>2</sup>)  
Terminals: Screw type  
Type of protection: IEC144 class IP65, when plugs are fitted correctly to the valves with the interface seals (supplied with plugs) in place.



Connector can be positioned at 90° intervals on valve by re-assembling contact holder into appropriate position inside connector housing.

Connectors with and without indicator lights are available (order separately):



Receptacle	Voltage (AC or DC)	Gray – "A" sol.	Black – "B" sol.
Without lights	—	710776	710775
With lights	12–24	977467	977466
	100–125	977469	977468
	200–240	977471	977470



## Insta-Plug Option

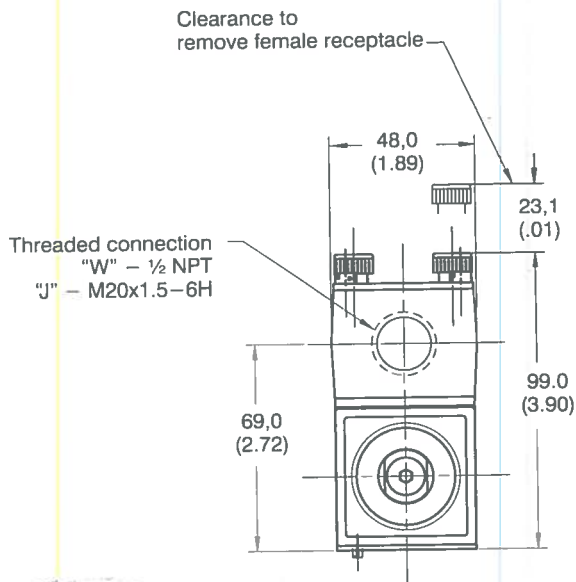
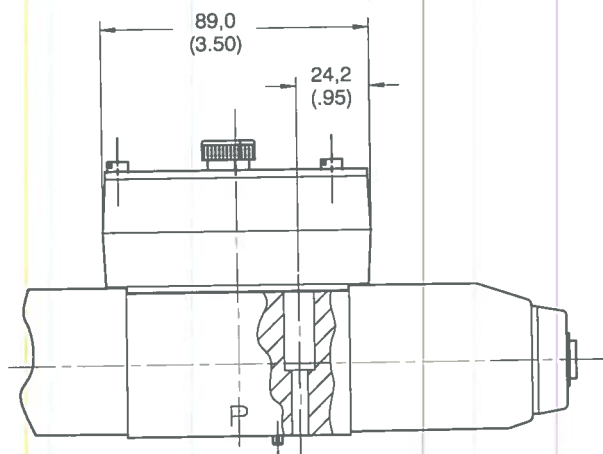
Vickers "Insta-Plug" provides a means of disconnecting electrical power to the valve without actually breaking individual wire connections. The male half of the plug is attached to the top of the valve body. Solenoid leads are connected to this half of the plug by Vickers. The mating plug is attached inside the wire housing. Terminals are provided on top of it for the convenience of connecting machine wires.

Two thumb screws are used to hold the wiring housing with the female plug half to the valve. These screws are captive to avoid loss when servicing. To disconnect the valve they are loosened until clear, allowing the wiring housing to be pulled away from the valve body; thereby disconnecting electrical power to the valve. Note that the ground fifth post is longer than the other four, providing a first-make/last-break ground feature.

The **PB** configuration includes both the male and female (retained in the housing) halves for a complete plug-in unit.

Solenoid indicator lights can also be furnished with the Insta-Plug feature. When furnished, the lights are pre-wired to the female half of the plug. Solenoids A and/or B are identified on the identification plate attached to the wiring housing.

Millimeters (inches)



## NFPA Hydraulic Valve Electrical Connector

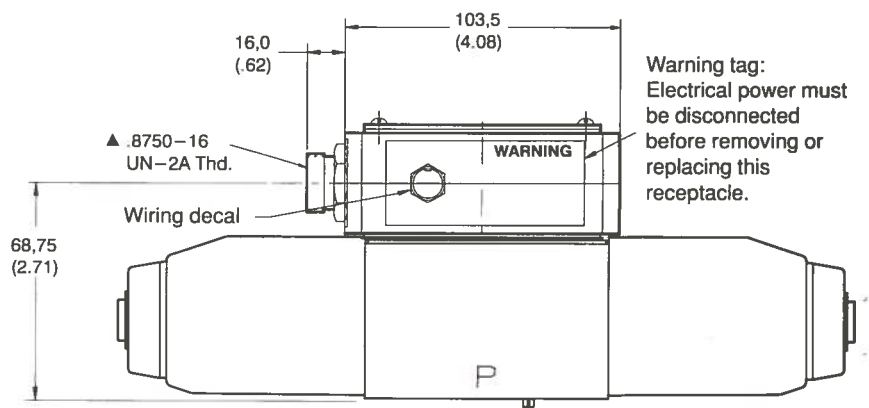
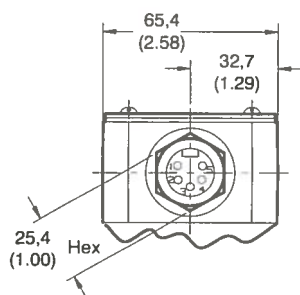
The receptacle is a standard three or five pole electrical connector with shortened leads and terminals added.

The five pole plug has four leads 101,6 mm (4.0") long and one 177,8 mm (7.0") long. The three pole plug has two leads 101,6 mm (4.0") long and one 177,8 mm (7.0") long.

All of the wires have Underwriters recognized non-solder insulated eyelet terminals. The #4 and #2 leads are attached to the "A" solenoid, and the #5 and #1 leads are attached to the "B" solenoid. The green wire is used for the ground connection (#8 screw furnished).

## Electrical Connector Plug

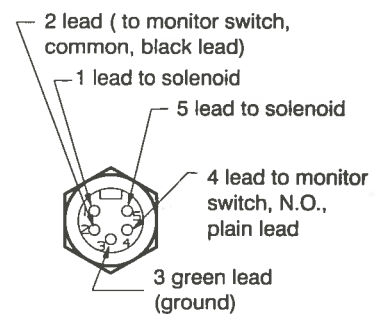
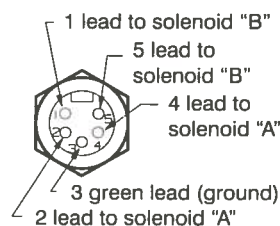
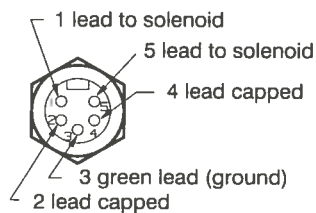
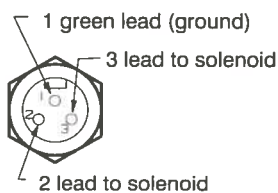
Millimeters (inches)



Warning tag:  
Electrical power must be disconnected before removing or replacing this receptacle.

## Models DG5S4-04\*\*-M-PA\*-W\*-60/70

Electrical Plug Feature  
PA3 - NFPA 3-pin conduit connector  
PA5 - NFPA 5-pin conduit connector



▲ Electrical connection is over solenoid on single solenoid models, and over "b" solenoid on dual solenoid models. See diagram plate for "b" solenoid location.

Electrical rating 600 volts, 3 pole, 10 amps and 5 pole, 8 amps. The female portable plug to be furnished by customer.



# Application Data

## Fluid Cleanliness

Proper fluid condition is essential for long and satisfactory life of hydraulic components and systems. Hydraulic fluid must have the correct balance of cleanliness, materials, and additives for protection against wear of components, elevated viscosity, and inclusion of air.

Essential information on the correct methods for treating hydraulic fluid is included in Vickers publication 561 "Vickers Guide to Systemic Contamination Control" available from your local Vickers distributor or by

contacting Vickers, Incorporated. Recommendations on filtration and the selection of products to control fluid condition are included in 561.

Recommended cleanliness levels, using petroleum oil under common conditions, are based on the highest fluid pressure levels in the system and are coded in the chart below. Fluids other than petroleum, severe service cycles, or temperature extremes are cause for adjustment of these cleanliness codes. See Vickers publication 561 for exact details.

Vickers products, as any components, will operate with apparent satisfaction in fluids with higher cleanliness codes than those described. Other manufacturers will often recommend levels above those specified. Experience has shown, however, that life of any hydraulic component is shortened in fluids with higher cleanliness codes than those listed below. These codes have been proven to provide a long, trouble-free service life for the products shown, regardless of the manufacturer.

Product	System Pressure Level bar (psi)		
	<70 ( <1000)	70-207 (1000-3000)	207+ ( 3000+)
Vane Pumps – Fixed	20/18/15	19/17/14	18/16/13
Vane Pumps – Variable	18/16/14	17/15/13	
Piston Pumps – Fixed	19/17/15	18/16/14	17/15/13
Piston Pumps – Variable	18/16/14	17/15/13	16/14/12
<b>Directional Valves</b>	<b>20/18/15</b>	<b>20/18/15</b>	<b>19/17/14</b>
Pressure/Flow Control Valves	19/17/14	19/17/14	19/17/14
CMX Valves	18/16/14	18/16/14	17/15/13
Servo Valves	16/14/11	16/14/11	15/13/10
Proportional Valves	17/15/12	17/15/12	15/13/11
Cylinders	20/18/15	20/18/15	20/18/15
Vane Motors	20/18/15	19/17/14	18/16/13
Axial Piston Motors	19/17/14	18/16/13	17/15/12
Radial Piston Motors	20/18/14	19/17/13	18/16/13

## Fluids and Seals

Fluorocarbon seals are available and are suitable for use with phosphate ester type fluids or their blends, water glycol, water-in-oil emulsion fluids and petroleum oil. Refer to data sheet I-286-S for hydraulic fluid and temperature recommendations.









**VICKERS**  
A TRINNOVA Company

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5445 Corporate Drive  
P.O. Box 302  
Troy, Michigan 48007-0302  
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Fax: 810-641-4948

**VICKERS®**

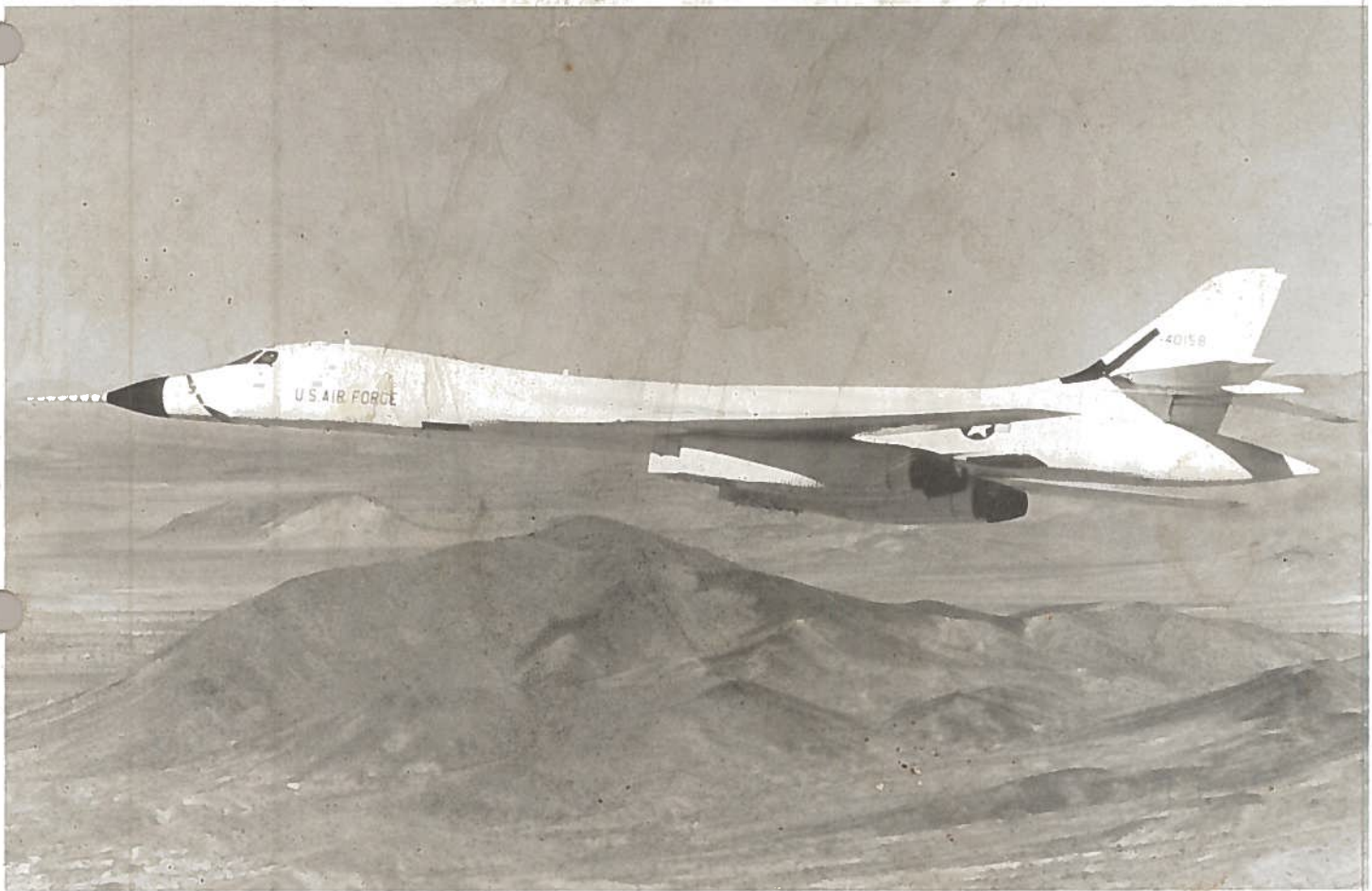
# CAPABILITIES

12-1-84

C5-1B

## HYDRAULIC COMPONENTS

### On Rockwell International's B-1B Strategic Bomber



Since 1970, Vickers AMD Division has been actively involved in applying production hydraulic pumps and motors in the Rockwell International strategic bomber. In addition to these production units, several new hydraulic components were developed for B-1 applications. The B-1 program is one of the largest and most comprehensive in which Vickers AMD has participated, demonstrating once again our ability as a single

source supplier of hydraulic components for complex aerospace applications. Four General Electric F101 turbofan engines provide main engine power for aircraft propulsion and the operation of aircraft rotating accessories. Accessory power is extracted through four remotely mounted accessory drive gearboxes (ADG) which are driven by the F101 engines through power takeoff shafts.

# HYDRAULIC SYSTEM

The B-1B strategic bomber's hydraulic system delivers more horsepower than that of any other production aircraft. The B-1B employs four independent 4000 psi hydraulic systems to furnish the hydraulic power required to operate all flight controls, landing gear and brakes, weapon bay doors, emergency electrical power system (EEPS) and wing sweep motors, as well as hydraulic power for the electronic equipment air recirculating loop (ARL) system fan motors, starting and engine nozzle control.

Mounted on each of the four accessory drive

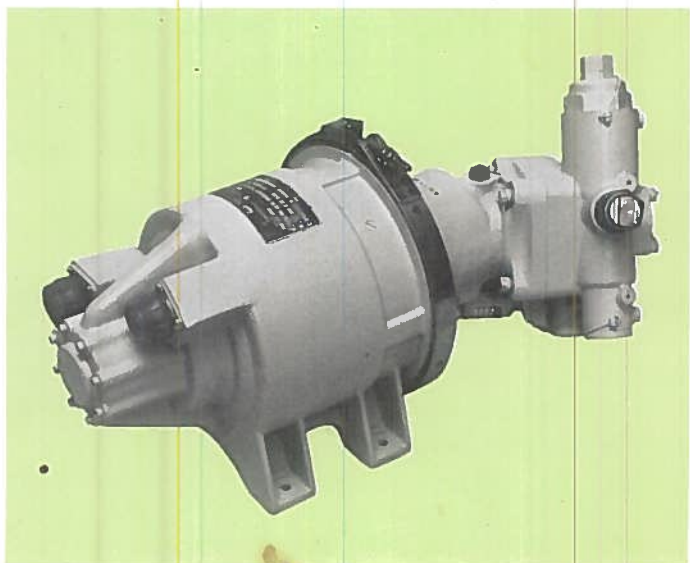
gearboxes is a pair of Vickers 3.00 cu. in./rev., 4000 psi pressure-compensated, variable-displacement inline pumps. Each pair supplies hydraulic power for one system. The pumps incorporate an integral electrical depressurization valve (EDV) which provides pump depressurization (reduced torque load) during engine start. During normal engine operation, each pump delivers 62.5 gpm at a speed of 5250 rpm. The four completely independent hydraulic systems can each deliver 125 gpm at 4000 psi which amounts to a total of 1150 hydraulic horsepower installed in each B-1B strategic bomber.

## COMPONENTS



### PV3-300-7A Main System Pumps

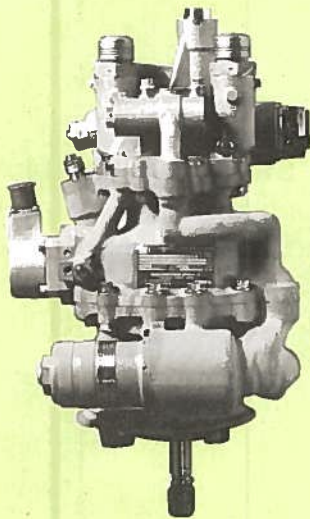
Each of the four separate hydraulic systems on the B-1B aircraft is supplied by two 62.5 gpm, 5250 rpm, variable-displacement, 4000 psi pressure-compensated inline piston pumps. Each pump is equipped with an electrical depressurization valve (EDV) and an integral outlet pressure surge dampener. Displacement is 3.123 cu. in./rev. Pump weight is 38.2 pounds.



### CMF1-095-7A EEPS Package

The emergency electrical power supply (EEPS) package is a fixed-displacement, bent-axis, piston-type motor incorporating an integral speed-control valve and flow-sensitive overspeed limiting throttle valve. The motor drives a 15 KVA Bendix generator at 8000 rpm. Displacement of the motor is 0.703 cu. in./rev. The weight of the complete EEPS package consisting of motor, generator, electrical control unit and contactor is 63.4 pounds.





#### **RPV3-104-1L Engine Nozzle Servo Pump**

Each of the four main engine variable nozzles are positioned by an 1.04 cu. in./rev. variable-displacement, bi-directional flow, inline piston pump controlled by an electromechanical servo valve. At 31.3 pounds, each pump provides up to 24.0 gpm at 4000 psi. The four pumps are driven by the engine accessory gearbox at 5976 rpm.



#### **PF4-228-7E Main Engine Vane Fuel Pump**

The four engines of the B-1B can consume over 8,000 gph. Each of the four Vickers 1.914 cu. in./rev. vane fuel pumps will supply up to 36.76 gpm or as little as 2.4 gpm. The pumps are gearbox-driven at speeds of 4600 to 6765 rpm with pressures varying from 340 psi to 1140 psi.



# SUMMARY

## of Vickers Hydraulic Components On The B-1B

MODEL NO.	PRODUCT	APPLICATION	QTY PER VEHICLE
PV3-300-7A	Inline Pump With EDV	Main System (Primary) Pump	8
CMF1-095-7A	Generator & Drive Motor, Generator Control Unit, Contractor	EEPS Sub-System	1
MPEF3-003-2	Inline Motorpump	APU Accumulator Recharge	2
MF1-060-13	Fixed Motor	APU Start Motor	2
MF1-060-14	Fixed Motor	Wing Sweep (Power)	4
MF3-005-15	Fixed Motor (Inline)	Wing Sweep (Control)	3
MF3-011-9A	Fixed Motor (Inline)	ARL System	4
MF3-011-10A	Fixed Motor (Inline)	ARL System	4
HF7C9-070-9A	Control Valve	ARL System	4
HF7C9-070-10A	Control Valve	ARL System	4

## Engine Components

PF4-228-7E	Vane Fuel	Fuel System	4
RPV3-104-1L	Inline Servo Pump	Nozzle Control	4



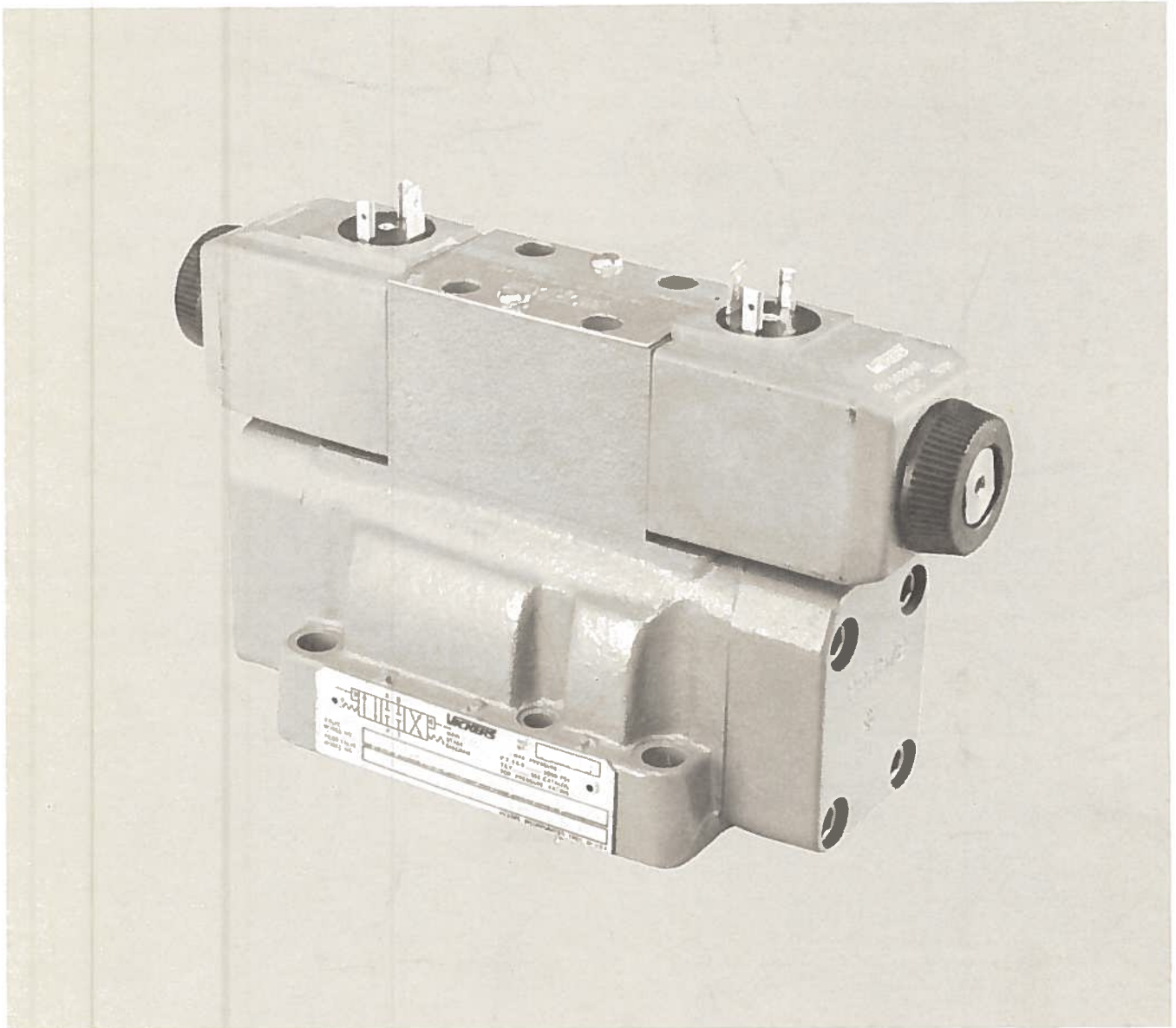
AEROSPACE-MARINE-DEFENSE

5353 Highland Dr. — Jackson, Mississippi 39206

VICKERS, INCORPORATED • A LIBBEY-OWENS-FORD COMPANY

## Solenoid Controlled Pilot Operated Directional Valves

(F3)DG5S4-04-\*\*(L)(\*\*)(X)(\*)(E)(T)(\*)-(V)M-(S\*)\*(\*\*)\*\*(L)\*\*5-\*\*\*-60/70



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.

MAIN STAGE SPOOL TYPE	AVAILABLE VALVE TYPE	SPOOL	MAIN STAGE ID PLATE	
			"A" ONLY	B/C/N
O	A/B/C/N	399891	433851	433852
1		*431972		433851
2		399892		433853
3		*399893		433854
4		413481		433855
6		399894		433856
8		399896		433855
9		413483		433852
11		*431972		433851
31		*399893		433851
33		399897		433856

**\* SPOOL ASSEMBLY NOTE**

Assemble type 1 & 3 spools with narrow center land toward "A" end of valve. "A" end is defined as being closest to CYL. port "A". Type 11 & 31 spools are installed in reverse of type 1 & 3 with narrow center lands toward "B" end of valve.

**■ PLUG INSTALLATION TABLE**

MODEL	"A" PLUG	"B" PLUG	"C" PLUG
DG5S4-04*	DOES NOT EXIST	367427	OUT
DG5S4-04*-E		113000	367427
DG5S4-04*-X		OUT	OUT
DG5S4-04*-X-E		113000	
DG5S4-04*-K/R/S	367427	113000	326427
DG5S4-04*-E-K/R/S	113000		
DG5S4-04*-X-K/R/S	OUT		OUT
DG5S4-04*-X-E-K/R/S	113000		

★ 113000 SOLID PLUG

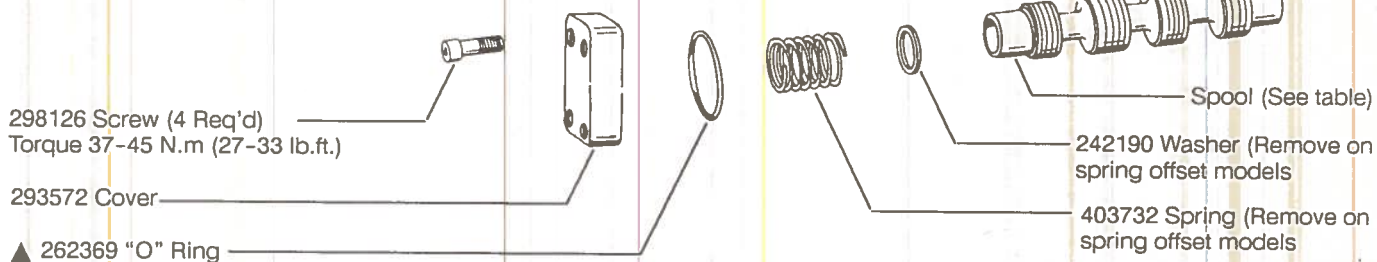
★ 367427 ORIFICE PLUG

**■ PLUG TORQUES (OILED)**

PLUG	N.M	lb. in.
7074	8.5-9.6	75-85
113000	5.0-5.9	45-52
367427	5.0-5.9	45-52

**NOTE**

Parts included in service kits are not sold separately.



VALVE MODEL CODE	MAIN STAGE SPOOL TYPE	PILOT VALVE MODEL CODE
DG5S4-04*A	O, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3(S)-2A-60
	4 & 8	DG4V-3(S)-28A-60
DG5S4-04*B	O, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3(S)-6B-60
	4 & 8	DG4V-3(S)-68B-60
DG5S4-04*C	O, 1, 2, 3, 6, 9, 11, 31, 33, 52, 521	DG4V-3(S)-6C-60
	4 & 8	DG4V-3(S)-68C-60
DG5S4-04*N	O, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3(S)-6N-60
	4 & 8	DG4V-3(S)-68N-60

See pilot valve service drawing for parts breakdown

- ▲ Included In F3 Seal Kit 696897
- ★ Included In Plug Kit 926545
- ◆ Not Available For Sale
- ♠ Used On Check Valve Models Only
- Plug Torques (See Table)
- Available Only In Kit Of 25 Each

MODEL	▲ SPRING
DG5S4-04-K	426859
DG5S4-04-R	418675
DG5S4-04-S	432350

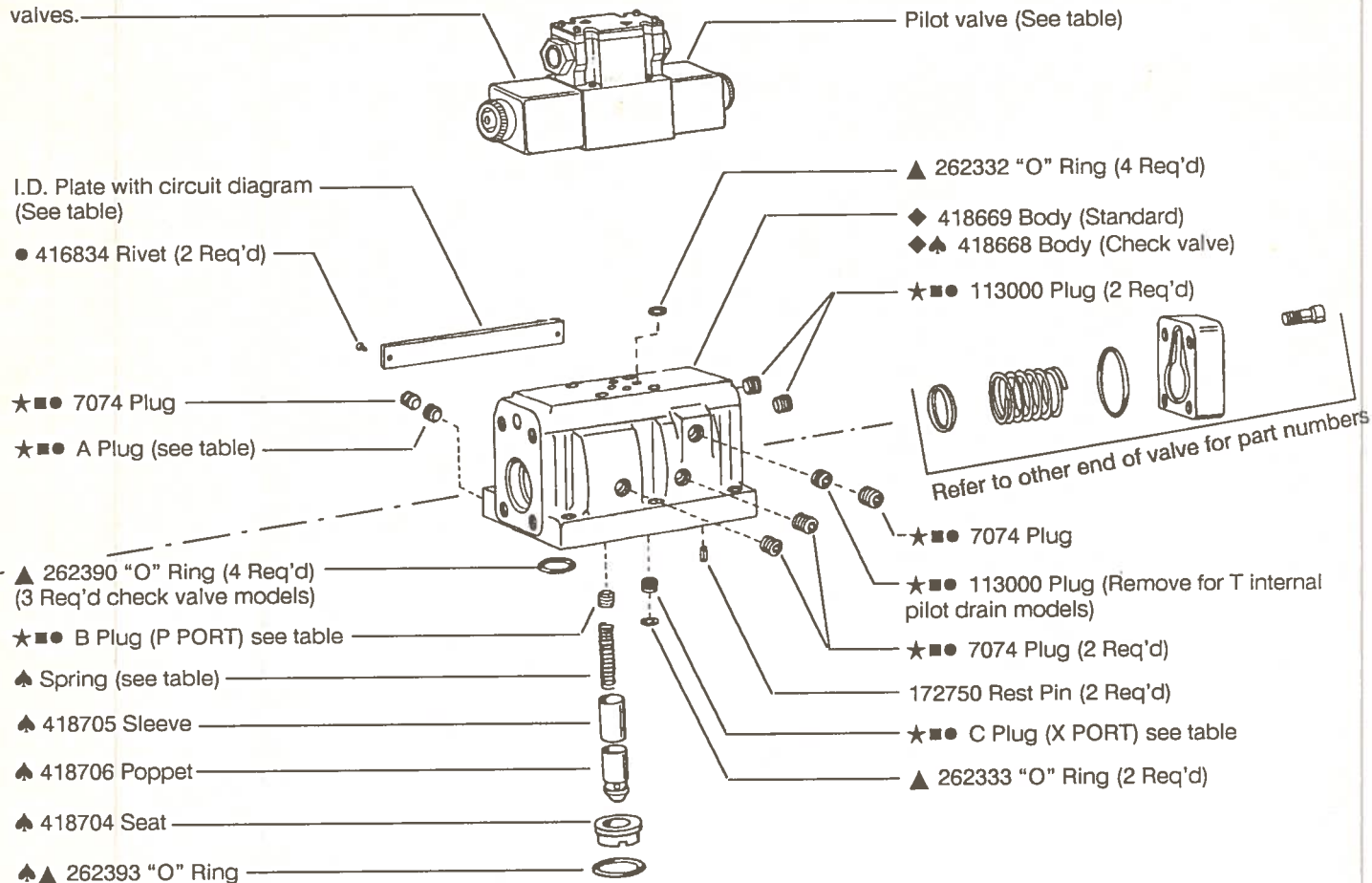
This solenoid removed on right hand A, & B, models. Refer to service drawings for more detailed information on left hand valves.

# PILOT STAGE BOLT KIT (INCLUDES 4 ATTACHING BOLTS)

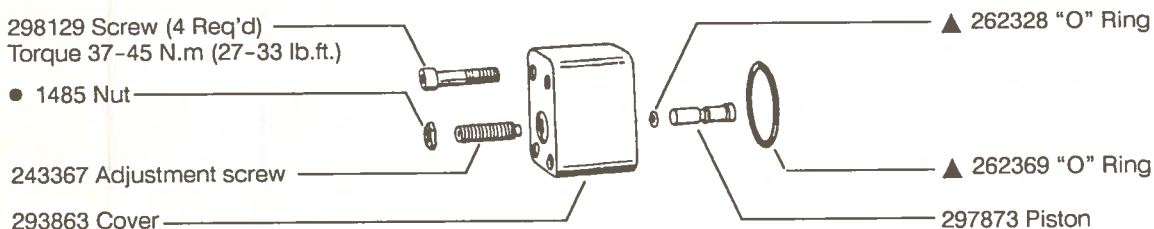
MODEL	BOLT KIT
W/O Pilot choke	696899
W/ Pilot choke	696900

Torque 4.5-5.7 N. m. (39.8-50.4 lb. in.)

See pilot choke service drawing for parts breakdown



Parts shown included in 941029 stroke adjustment kit. Order two kits if stroke adjustment is required for both ends.



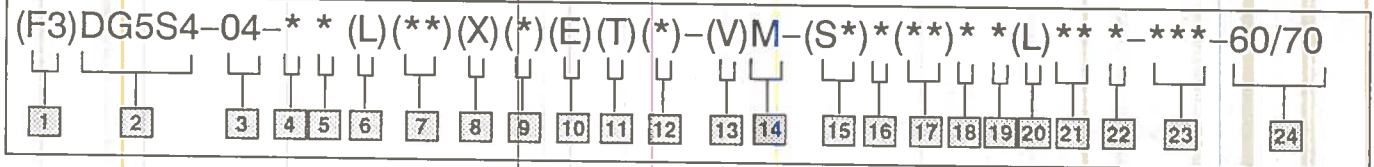
Stroke adjustment parts either end or both

## NOTE

For satisfactory service life of these components in industrial applications, use full flow filtration to provide fluid which meets ISO cleanliness code 18/15 or cleaner.



# Model Code



- 1** Seals for mineral oil & fire resistant fluids
- 2** Directional control valve  
Manifold or subplate mounted  
Solenoid controlled  
Pilot operated  
Rated pressure 210 bar (3000 psi)

- 3** Interface  
04 - NFPA-D04 (ISO-4401-07)

- 4** Spool type (see table)

- 5** Spool/Spring arrangement  
A - Spring offset, to CYL. A  
B - Spring centered, sol. A removed  
C - Spring centered  
F - Spring offset, to CYL. A shift to center  
N - No spring detented

- 6** Left hand  
L - Left hand (single solenoid only)  
Blank - Omit when not required

- 7** Manual override option  
Blank - Plain override solenoid ends only  
H - Waterproof override solenoid ends only  
H2 - Waterproof override both ends of single solenoid  
P2 - Plain override both ends of single solenoid  
Y - Lockable manual overrides solenoid ends only/DC only  
Z - No overrides in either end

- 8** Response type  
X - Fast response  
Blank - Standard low shock models

- 9** Spool control modifications  
1 - Stroke adjustment  
2 - Pilot choke adjustment  
3 - Pilot choke & stroke adjustment  
7 - Stroke adjustment CYL. A only  
8 - Stroke adjustment CYL. B only  
2-7 - Dual pilot choke & stroke ADJ. A port end only  
2-8 - Dual pilot choke & stroke ADJ. B port end only  
Blank - Omit when not required

- 10** Pilot pressure  
E - External pilot pressure  
Omit - Internal pilot pressure

- 11** Pilot drain  
T - Internal pilot Drain  
Omit - External pilot drain

- 12** Pressure port check valve  
K - 0.35 bar (5 psi) cracking pressure  
R - 3.45 bar (50 psi) cracking pressure  
S - 5.20 bar (75 psi) cracking pressure  
Blank - Omit when not required

- 13** Solenoid energization identity  
Blank - Standard arrangement for ANSI B93.9 (energise solenoid A for flow P to A port)  
V - Solenoid identification determined by position of solenoid. (Solenoid A at port A end and/or solenoid B at port B end. (All 4 & 8 spools are always V code)

- 14** Flag symbol heading electrical options & features

- 15** Spool indicator switch  
Available on high performance models, DG4V-3, only.  
Omit when not required.  
S1 - Options available on U only)  
S2 - Options available on U only)  
S3 - Options available on P\* only  
S4 - Options available on P\* only  
S5 - Options available on FW/FJ only

- 16** Coil type  
U - ISO 4400  
F - Flying lead  
SP1 - Single 6,3 MM spade to IEC 760  
SP2 - Dual 6,3 MM spade to IEC 760

- 17** Electrical connections (F type coil only) omit if not required  
T - Wired terminal block  
PA - Instaplug male receptacle only  
PB - Instaplug male & female receptacle  
PA3 - Three pin connector  
PA5 - Five pin connector

- 18** Housing (F type coils only)  
W - 1/2 NPT thread wiring housing  
J - 20 mm thread wiring housing

- 19** Electrical options  
1 - ISO with fitted plug, U type coils only  
6 - ISO with fitted plug, & lights  
U type coils only

- 20** Solenoid indicator lights (F build only) used with T terminal block models. (Omit if not required)

- 21** Coil identification

- 22** Pilot valve code (tank pressure rating)  
2 - 10 bar (145 psi) DG4V3-60  
5 - 100 bar (1450 psi) DG4V3S-60  
6 - 160 bar (2285 psi) DG4V3-60  
7 - 210 bar (3000 psi) DG4V3-60

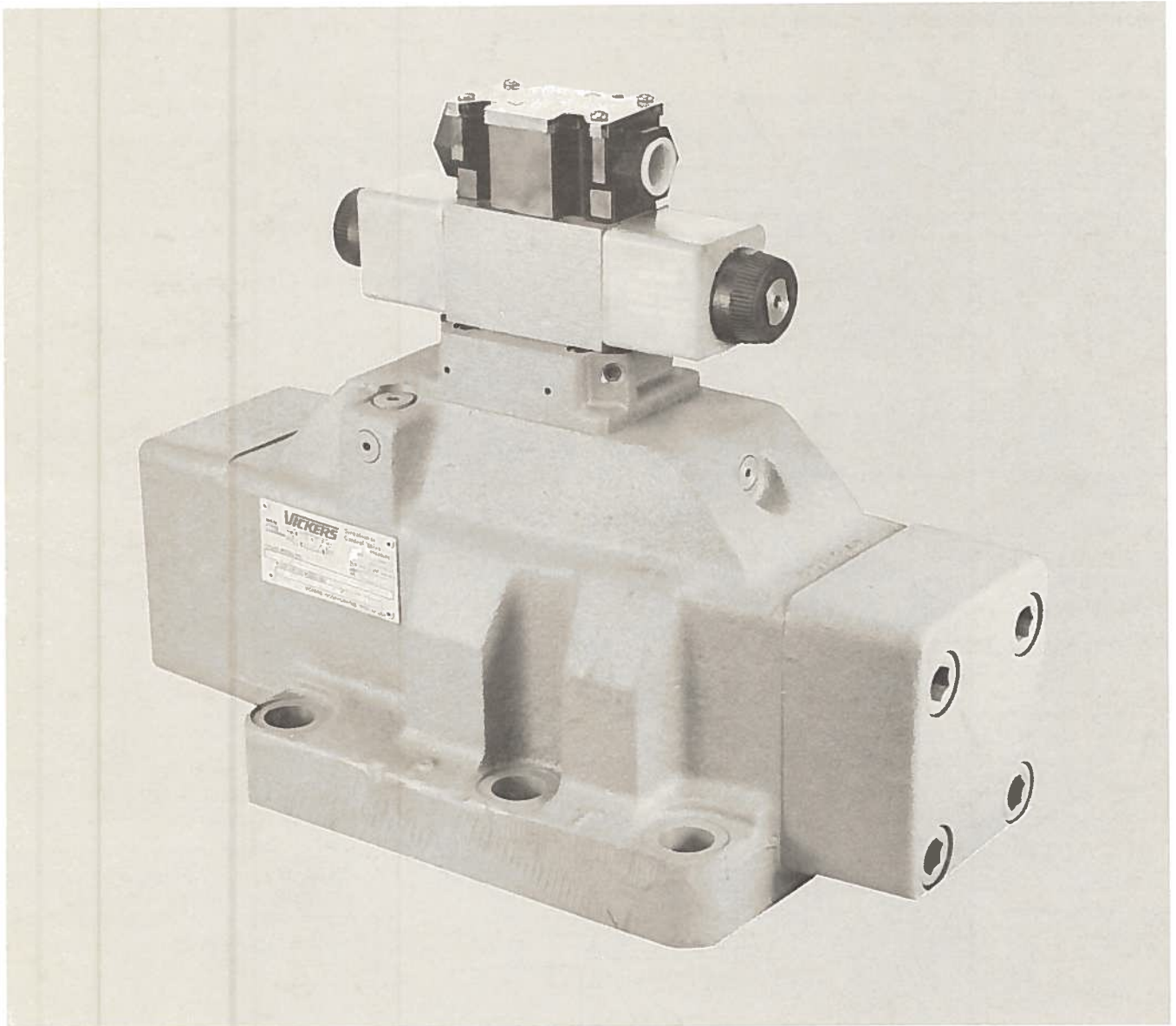
- 23** Pilot valve port orifices

- 24** Design  
60 - DG4V3S-60 pilot valve  
70 - DG4V3-60 pilot valve

**6** Thru **23** included in pilot valve model code

# Solenoid Controlled Pilot Operated Directional Valves

(F3)DG5S4-10-\*\*(L)\*\*(X)(\*)(E)(T)(\*)-(V)M-(S\*)\*(\*\*)\*\*(L)\*\*\*-\*\*\*-90/100



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.

MAIN STAGE SPOOL TYPE	AVAILABLE VALVE TYPE	SPOOL	MAIN STAGE ID PLATE	
			"A" ONLY	B/C/N
O	A/B/C/N	364037	400975	400976
1		*331404		400977
2		364038		400978
3		*277479		400979
4		281193		400980
6		364039		400981
8		364041		400980
9		277563		400976
11		*331404		632700
31		*277479		580475
33		364042		400981

#### \* SPOOL ASSEMBLY NOTE

Assemble type 1 & 3 spools with narrow center land toward "A" end of valve. "A" end is defined as being closest to CYL. port "A". Type 11 & 31 spools are installed in reverse of type 1 & 3 with narrow center lands toward "B" end of valve.

#### ■ PLUG TORQUES (OILED)

PLUG	N.M	lb. in.
7074	8.5-9.6	75-85
30560	8.5-9.6	75-85
113000	5.0-5.9	45-52
161809	5.0-5.9	45-52
343740	15.0-16.0	133-147
363889	20.5-22.5	181-199
407533	12.1-12.4	107-110

#### NOTE

SAE straight thread plugs used on exterior of valve.

#### ■ PLUG INSTALLATION TABLE

MODEL	"A" PLUG	"B" PLUG	"C" PLUG
DG5S4-10*	DOES NOT EXIST	30560	
DG5S4-10*-E		7074	30560
DG5S4-10*-X			
DG5S4-10*-X-E			
DG5S4-10*-K/R/S	161809	7074	
DG5S4-10*-E-K/R/S	113000		30560
DG5S4-10*-X-K/R/S			
DG5S4-10*-X-E-K/R/S	113000		

#### NOTE

Parts included in service kits are not sold separately.

107758 Washer (Remove on A offset models)

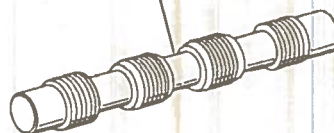
280931 Spring (Remove on A offset models)

▲ 262409 "O" Ring

□ 298168 Screw (4 Req'd)  
Torque 205-230 N.m  
(150-170 lb.ft.)

276948 Cover

Spool (See table)



VALVE MODEL CODE	MAIN STAGE SPOOL TYPE	PILOT VALVE MODEL CODE
DG5S4-10*A	O, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3(S)-2A-60
	4 & 8	DG4V-3(S)-2AL-VM-60
DG5S4-10*B	O, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3(S)-6B-60
	4 & 8	DG4V-3(S)-6BL-VM-60
DG5S4-10*C	O, 1, 2, 3, 6, 9, 11, 31, 33, 52, 521	DG4V-3(S)-6C-60
	4 & 8	DG4V-3(S)-6C-VM-60
DG5S4-10*N	O, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3(S)-6N-60
	4 & 8	DG4V-3(S)-6N-VM-60

See pilot valve service drawing for parts breakdown

#### SEAL KIT NOTE

Valves are manufactured as shown with F3 seals used internally. Interface seals are standard Nitrile material and are converted to F3 in the seal kit. All seals in the seal kit are F3.

- ▲ Included In F3 Seal Kit 696898
- ★ Included In Plug Kit 941263
- Included In Fastener Kit 941262
- ◆ Not Available For Sale
- ♠ Used On Check Valve Models Only
- Plug Torques (See Table)
- Available Only In Kit Of 25 Each



MODEL	♠ SPRING
DG5S4-10-K	247287
DG5S4-10-R	276428
DG5S4-10-S	432353

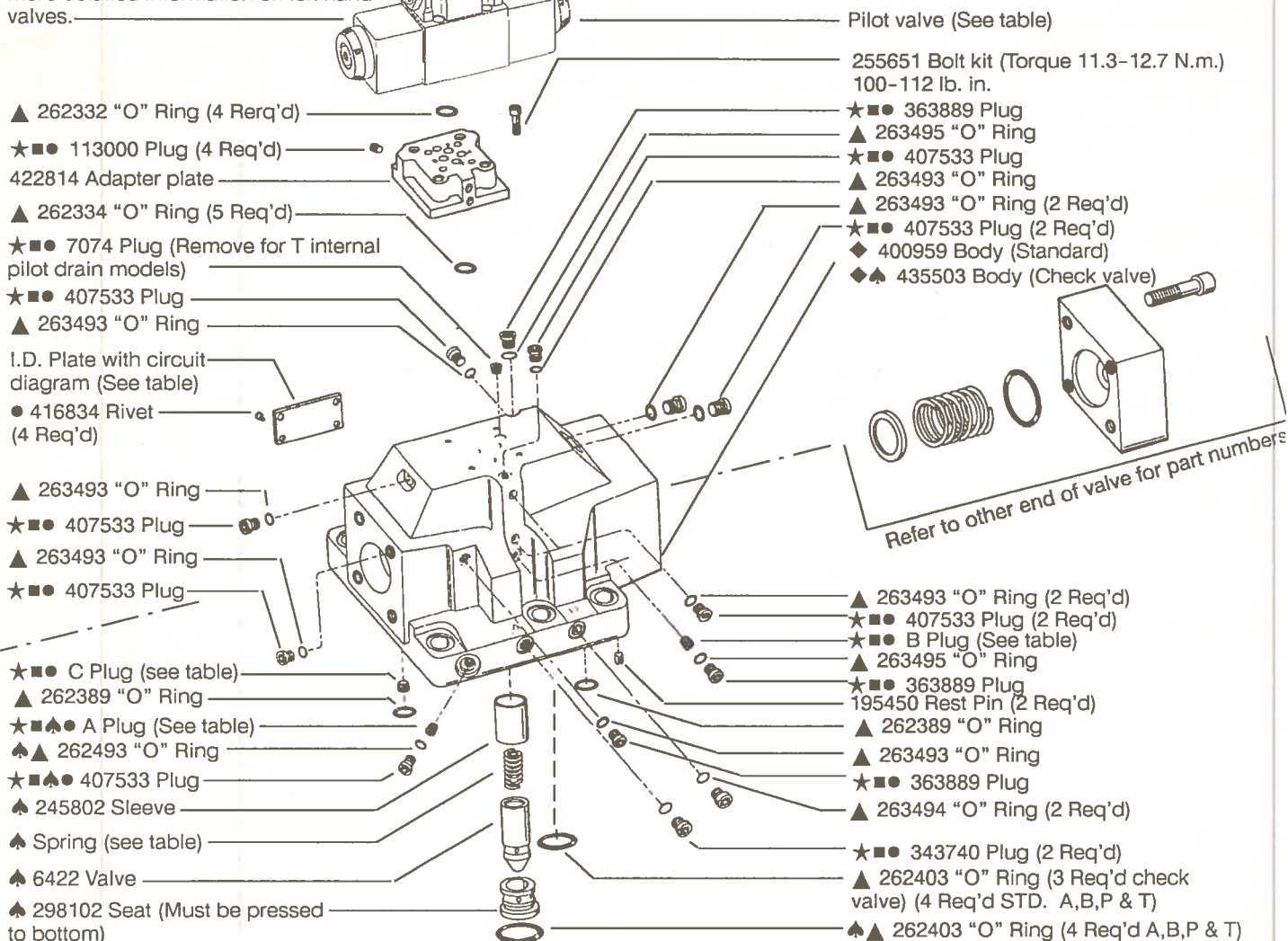
This solenoid removed on right hand A, & B, models. Refer to service drawings for more detailed information on left hand valves.

#### PILOT STAGE BOLT KIT (INCLUDES 4 ATTACHING BOLTS)

MODEL	BOLT KIT
W/O Pilot choke	696899
W/ Pilot choke	696900

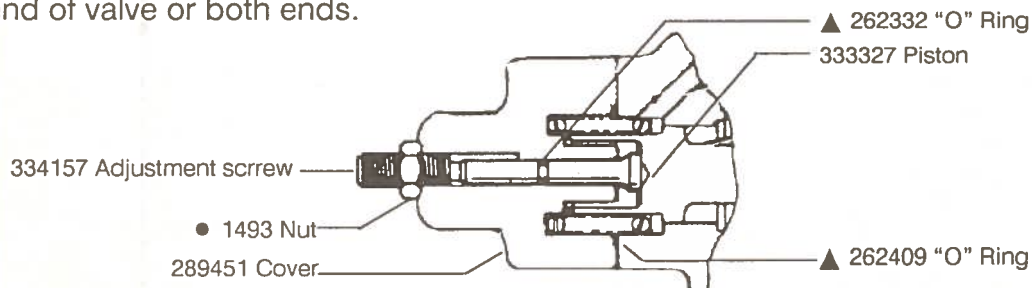
Torque 4.5-5.7 N. m. (40-50 lb. in.)

See pilot choke service drawing for parts breakdown



#### Stroke Adjustment Parts

(Either end of valve or both ends.)

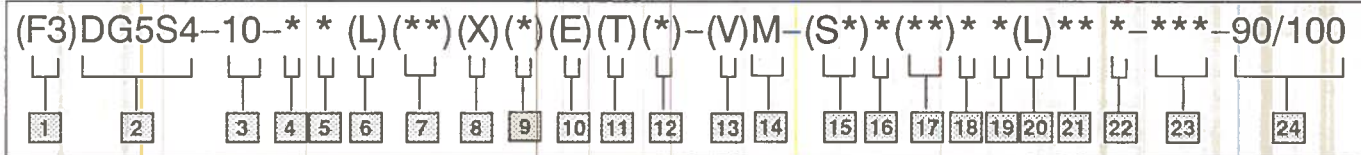


#### NOTE

For satisfactory service life of these components in industrial applications, use full flow filtration to provide fluid which meets ISO cleanliness code 18/15 or cleaner.



# Model Code



**1** Seals for mineral oil & fire resistant fluids

**2** Directional control valve  
Manifold or subplate mounted  
Solenoid controlled  
Pilot operated, Sliding spool  
4 way flow direction

**3** Interface (Valve size 1-1/4 inch)  
10 - NFPA-D10 (ISO-4401-10)

**4** Spool type (see table)

**5** Spool/Spring arrangement

A - Spring offset, to CYL. A  
B - Spring centered, sol. A removed  
C - Spring centered  
F - Spring offset, to CYL. A shift to center  
N - No spring detented

**6** Left hand

L - Left hand (single solenoid only)  
Blank - Omit when not required

**7** Manual override option

Blank - Plain override solenoid ends only  
H - Waterproof override solenoid ends only  
H2 - Waterproof override both ends of single solenoid  
P2 - Plain override both ends of single solenoid  
Y - Lockable manual overrides solenoid ends only/DC only  
Z - No overrides in either end

**8** Response type

X - Fast response  
Blank - Standard low shock models

**9** Spool control modifications

1 - Stroke adjustment  
2 - Pilot choke adjustment  
3 - Pilot choke & stroke adjustment  
7 - Stroke adjustment CYL. A only  
8 - Stroke adjustment CYL. B only  
2-7 - Dual pilot choke & stroke ADJ. A port end only  
2-8 - Dual pilot choke & stroke ADJ. B port end only  
Blank - Omit when not required

**10** Pilot pressure

E - External pilot pressure  
Omit - Internal pilot pressure

**11** Pilot drain

T - Internal pilot Drain  
Omit - External pilot drain

**12** Pressure port check valve

K - 0.35 bar (5 psi) cracking pressure  
R - 3.45 bar (50 psi) cracking pressure  
S - 5.20 bar (75 psi) cracking pressure  
Blank - Omit when not required

**13** Solenoid energization identity

Blank - Standard arrangement for ANSI B93.9 (energise solenoid A for flow P to A port)  
V - Solenoid identification determined by position of solenoid. (Solenoid A at port A end and/or solenoid B at port B end. (All 4 & 8 spools are always V code)

**14** Flag symbol heading electrical options & features

**15** Spool indicator switch

Available on high performance models, DG4V-3, only.  
Omit when not required.

S1 - Options available on U only  
S2 - Options available on U only  
S3 - Options available on P\* only  
S4 - Options available on P\* only  
S5 - Options available on FW/FJ only

**16** Coil type

U - ISO 4400  
F - Flying lead  
SP1 - Single 6,3 MM spade to IEC 760  
SP2 - Dual 6,3 MM spade to IEC 760

**17** Electrical connections (F type coil only) omit if not required

T - Wired terminal block  
PA - Instaplug male receptacle only  
PB - Instaplug male & female receptacle  
PA3 - Three pin connector  
PA5 - Five pin connector

**18** Housing (F type coils only)

W - 1/2 NPT thread wiring housing  
J - 20 mm thread wiring housing

**19** Electrical options

1 - ISO with fitted plug, U type coils only  
6 - ISO with fitted plug, & lights  
U type coils only

**20** Solenoid indicator lights (F build only) used with T terminal block models. (Omit if not required)

**21** Coil Identification

**22** Pilot valve code (tank pressure rating)

2 - 10 bar (145 psi) DG4V3-60  
5 - 100 bar (1450 psi) DG4V3S-60  
6 - 160 bar (2285 psi) DG4V3-60  
7 - 210 bar (3000 psi) DG4V3-60

**23** Pilot valve port orifices

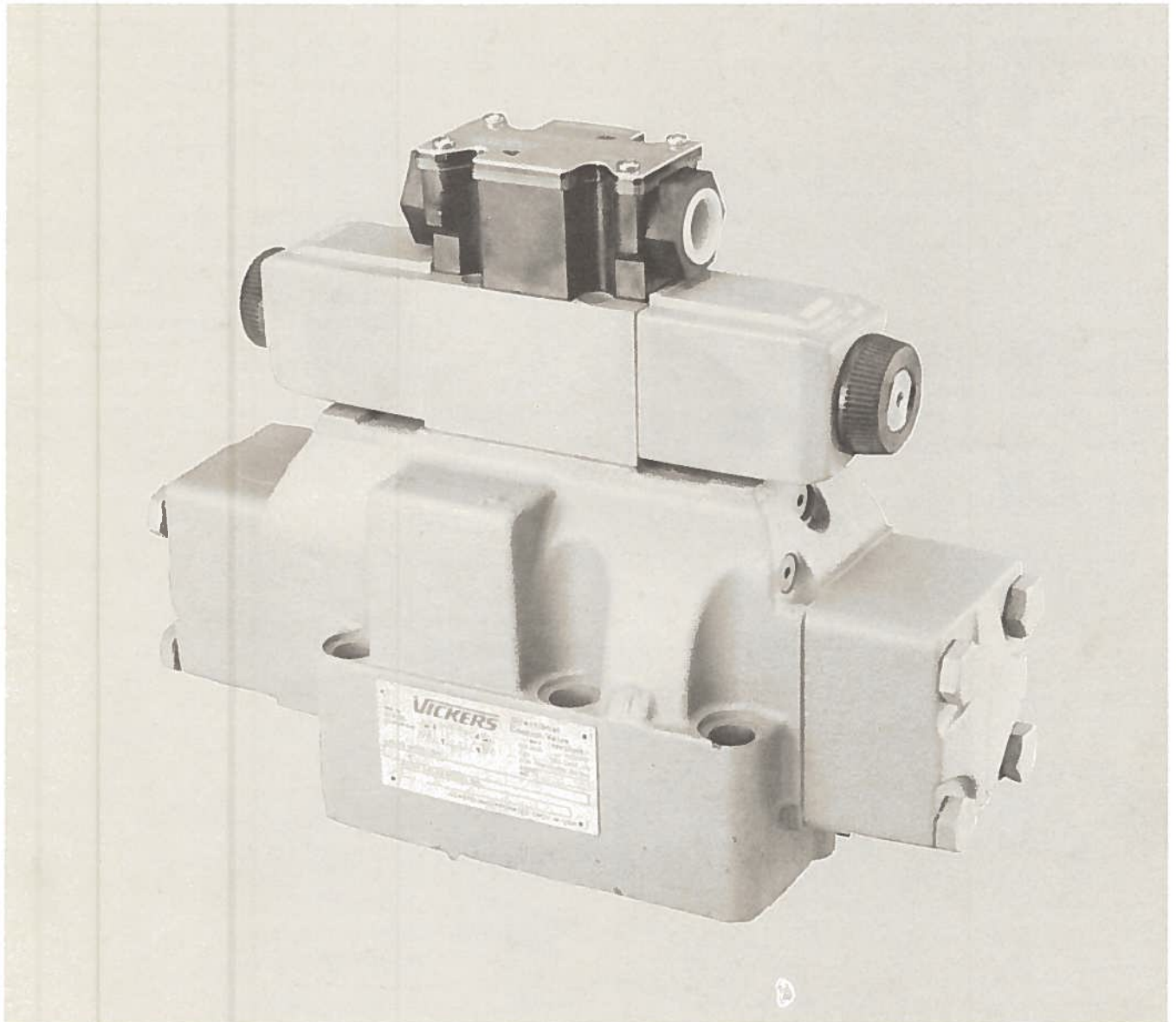
**24** Design

90 - DG4V3S-60 pilot valve  
100 - DG4V3-60 pilot valve

**6** Thru **23** included in pilot valve model code

# Solenoid Controlled Pilot Operated Directional Valve

DG5S-8-\*D(L)-(\*) (X)-(\*)-(E)-(T)(\*)-(V)M-(S\*)-\*(\*\*)\*\*(L)-\*\*\*-\*\*\*-30/40



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.

Parts shown included in stroke ADJ. kit 941154. Stroke ADJ. CYL. "B" end only.

470843 Screw (4 Req'd)  
Torque 49-59 N.m.  
(36-44 lb. ft.)

135369 ADJ. Screw

289339 Cover

▲ 262330  
O-Ring

▲ 262402  
O-Ring

223075 Piston

1489 Nut

■ PLUG	TORQUES (OILED)	
	N.m.	lb. in.
113000	5.0-5.9	45-52
237588		
343740	15.0-16.0	133-142
398071	9.8-10.2	87-90
407533	12.1-12.4	107-110

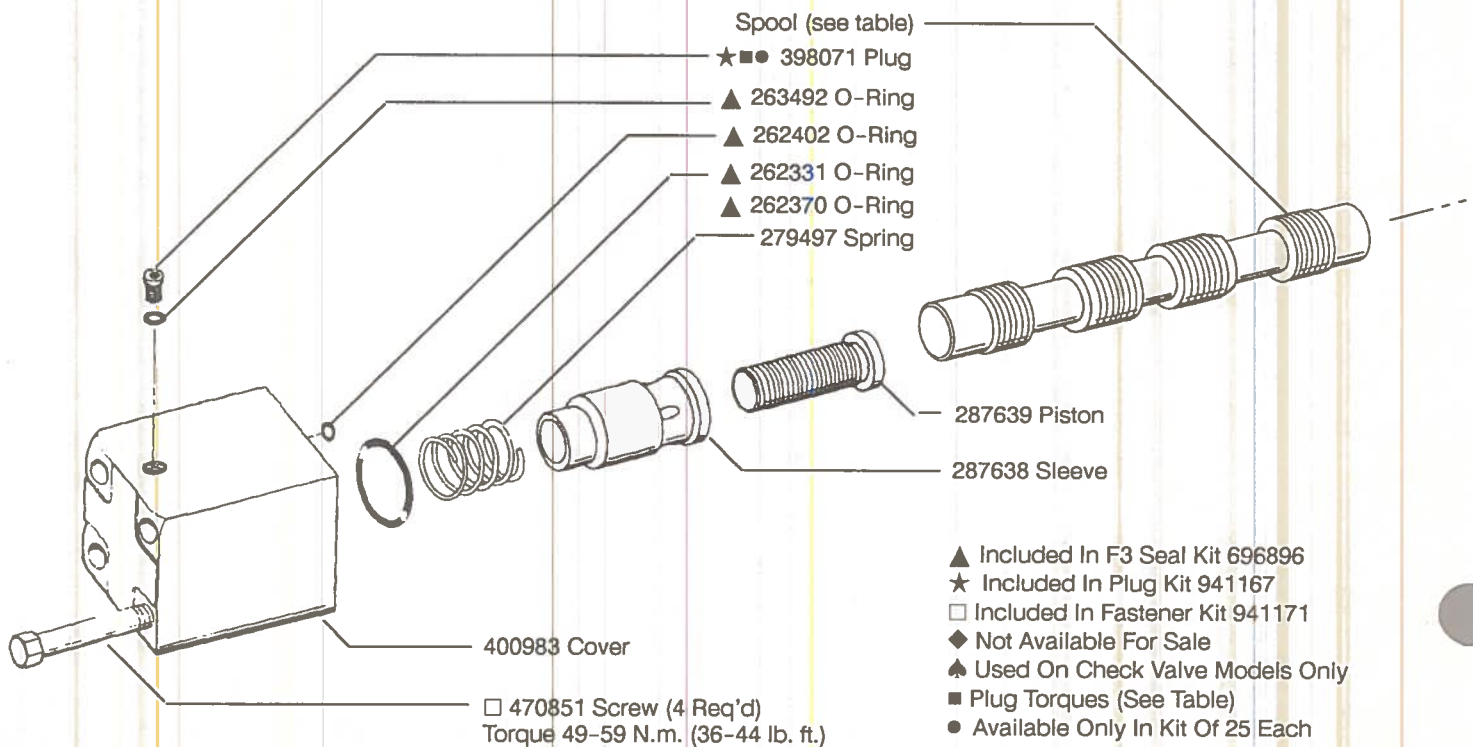
VALVE MODEL CODE	MAIN STAGE SPOOL TYPE	PILOT VALVE MODEL CODE
DG5S-8-*D-30	O, 1, 2, 3, 6, 9,	DG4V-3S-7C-60
DG5S-8-*D-40	11, 31, 33	DG4V-3-7C-60
DG5S-8-*D-30	4 & 8	DG4V-3S-78C-60
DG5S-8-*D-40		DG4V-3S-78C-60

See pilot valve service drawing for parts breakdown

MAIN STAGE SPOOL TYPE	SPOOL	ID PLATE
DG5S-8-OD	363495	400967
DG5S-8-1D	*276623	400968
DG5S-8-2D	363496	400969
DG5S-8-3D	*276625	400970
DG5S-8-4D	276626	400971
DG5S-8-6D	363498	400972
DG5S-8-8D	363499	400971
DG5S-8-9D	363500	400967
DG5S-8-11D	*276623	573685
DG5S-8-31D	*276625	573685
DG5S-8-33D	363501	400972

**\* SPOOL ASSEMBLY NOTE**

Assemble type 1 & 3 spools with narrow center land toward "A" end of valve.  
"A" end is defined as being closest to CYL. port "A". Type 11 & 31 spools are installed in reverse of type 1 & 3 with narrow center lands toward "B" end of valve.





**PILOT STAGE BOLT KIT (INCLUDES 4 ATTACHING BOLTS)**

MODEL	BOLT KIT
W/O Pilot choke	696892
W/ Pilot choke	696893

Torque 4.5–5.7 N. m. (39.8–50.4 lb. in.)

See pilot choke service drawing for parts breakdown

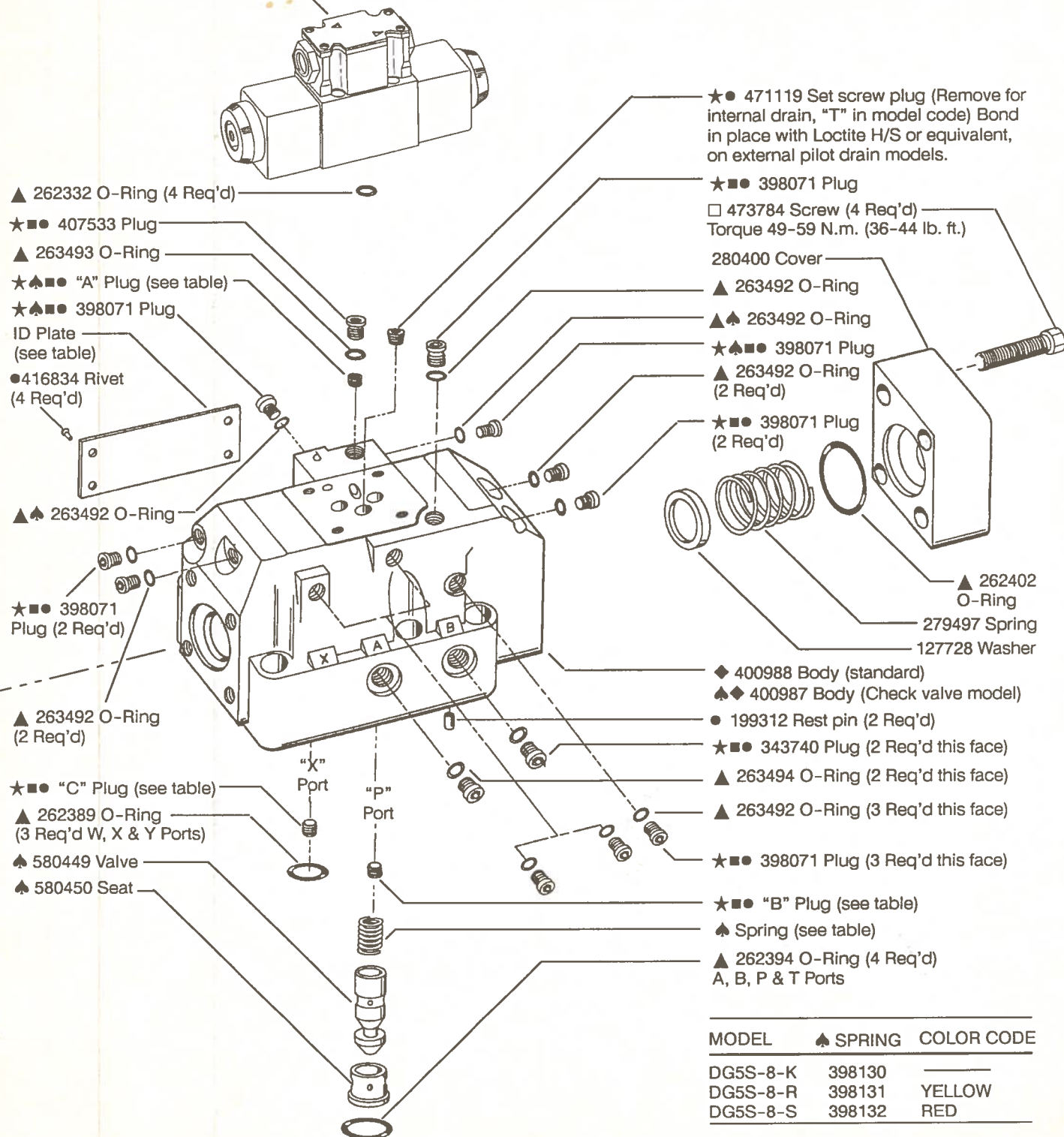
Pilot valve see table and refer to service drawing for more detailed information.

**■ PLUG INSTALLATION TABLE**

MODEL	"A" PLUG	"B" PLUG	"C" PLUG
DG5S-8-*D-**	DOES NOT EXIST	237588	—
DG5S-8-*D-**-E		113000	237588
DG5S-8-*D-**-X		—	—
DG5S-8-*D-**-X-E	—	113000	—
DG5S-8-*D-**-KRS	237588	DOES NOT EXIST	—
DG5S-8-*D-**-E-KRS	113000		237588
DG5S-8-*D-**-X-KRS	—		—
DG5S-8-*D-**-X-E-KRS	113000	—	—

113000 Solid plug

237588 Orifice plug





# Model Code

(F3)DG5S-8-* D (L)(*)(X)-(*)-(E)-(T)(*)-(V)M-(S*)*(**) ** (L)-** 5-***-30/40																							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

**1** Seals for mineral oil & fire resistant fluids

**2** Directional control valve  
Manifold or subplate mounted  
Solenoid controlled  
Pilot operated  
Rated pressure 210 Bar (3000 psi)

**3** Interface  
8 - NFPA-D06 (ISO-4401-08)

**4** Spool type (see table)

**5** Spool/Spring arrangement  
D - Pressure centered

**6** Left hand  
L - Left hand (single solenoid only)  
Blank - Omit when not required

**7** Manual override option  
Blank - Plain override solenoid ends only  
H - Waterproof override solenoid ends only  
H2 - Waterproof override both ends of single solenoid  
P2 - Plain override both ends of single solenoid  
Y - Lockable manual overrides solenoid ends only/DC only  
Z - No overrides in either end

**8** Response type  
X - Fast response  
Blank - Standard low shock models

**9** Spool control modifications

2 - Pilot choke adjustment  
8 - Stroke adjustment CYL. B only  
2-8 - Dual pilot choke & stroke ADJ. B port end only  
Blank - Omit when not required

**10** Pilot pressure  
E - External pilot pressure  
Omit - Internal pilot pressure

**11** Pilot drain  
T - Internal pilot Drain  
Omit - External pilot drain

**12** Pressure port check valve  
K - 0.35 bar (5 psi cracking pressure)  
R - 3.45 bar (50 psi cracking pressure)  
S - 5.20 bar (75 psi cracking pressure)  
Blank - Omit when not required

**13** Solenoid energization identity  
Blank - Standard arrangement for ANSI B93.9 (energise solenoid A for flow P to A port)  
V - Solenoid identification determined by position of solenoid. (Solenoid A at port A end and/or solenoid B at port B end. (All 4 & 8 spools are always V code)

**14** Flag symbol heading electrical options & features

**15** Spool indicator switch  
Available on high performance models, DG4V-3, only.  
Omit when not required.  
S1 - Options available on U only  
S2 - Options available on U only  
S3 - Options available on P\* only  
S4 - Options available on P\* only  
S5 - Options available on FW/FJ only

**16** Coil type

U - ISO 4400  
F - Flying lead  
SP1 - Single 6,3 MM spade to IEC 760  
SP2 - Dual 6,3 MM spade to IEC 760

**17** Electrical connections (F type coil only) omit if not required  
T - Wired terminal block  
PA - Instaplug male receptacle only  
PB - Instaplug male & female receptacle  
PA3 - Three pin connector  
PA5 - Five pin connector

**18** Housing (F type coils only)  
W - 1/2 NPT thread wiring housing  
J - 20 mm thread wiring housing

**19** Electrical options  
1 - ISO with fitted plug, U type coils only  
6 - ISO with fitted plug, & lights  
U type coils only

**20** Solenoid indicator lights (F build only) used with T terminal block models. (Omit if not required)

**21** Coil identification

**22** Pilot valve code (tank pressure rating)  
2 - 10 bar (145 psi) DG4V3-60  
5 - 100 bar (1450 psi) DG4V3S-60  
6 - 160 bar (2285 psi) DG4V3-60  
7 - 210 bar (3000 psi) DG4V3-60

**23** Pilot valve port orifices

**24** Design  
30 - DG4V3S-60 pilot valve  
40 - DG4V3-60 pilot valve

**6** Thru **23** Included in pilot valve model code

## Service Parts Information

### DG17V-3-\*\*(L)-60 Lever operated CETOP 3 directional control valve

Spool Type	Model		
	A	C	N
0	893032	893025	893025
2	893033	893026	893026
6	893034	893027	893027
7		893028	893028
8		893029	
22	893035		
33		893030	893030

Assemble "A" type spools in body with longer end land opposite operator.

#### NOTE

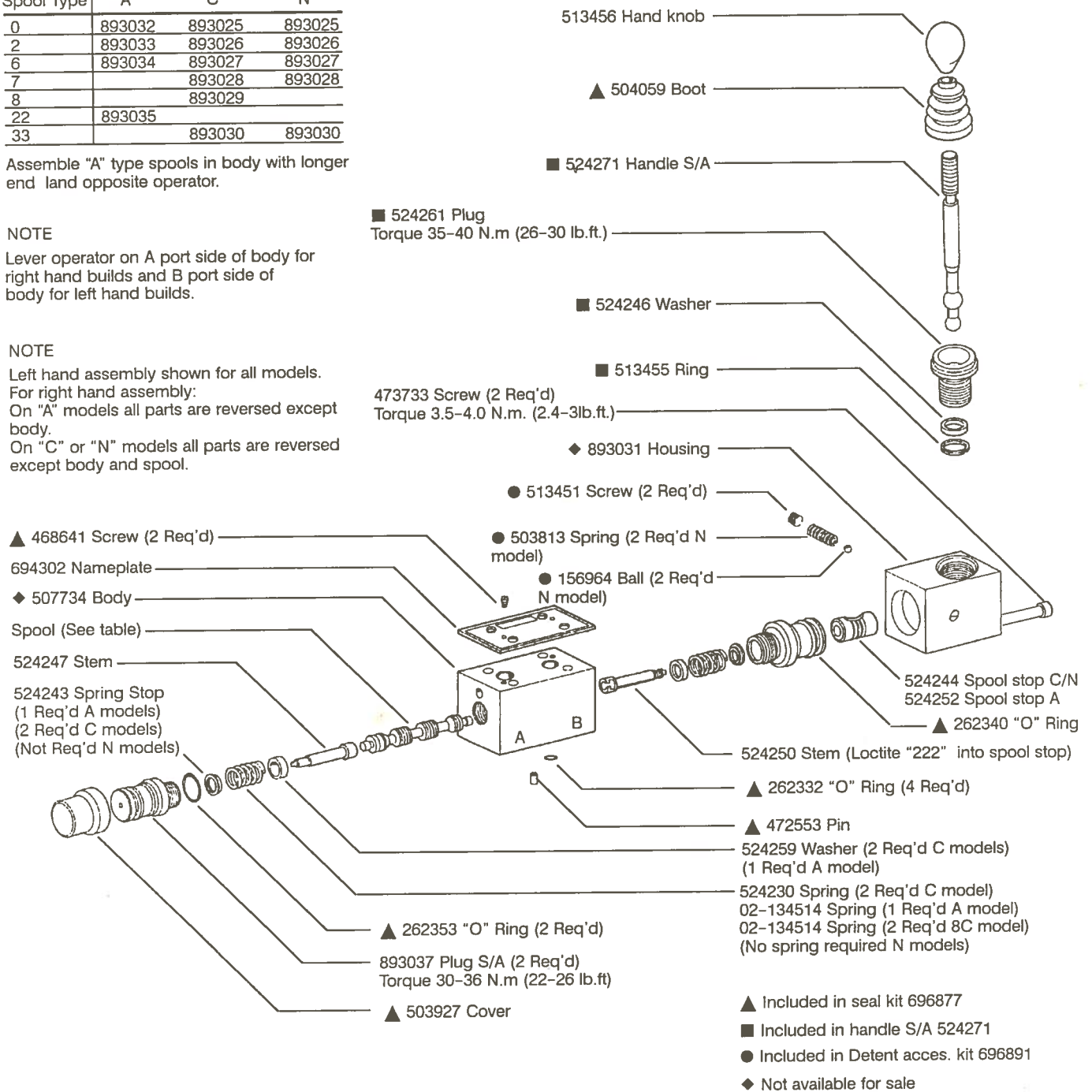
Lever operator on A port side of body for right hand builds and B port side of body for left hand builds.

#### NOTE

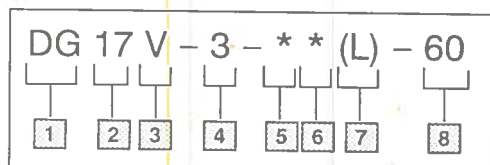
Left hand assembly shown for all models.  
For right hand assembly:  
On "A" models all parts are reversed except body.  
On "C" or "N" models all parts are reversed except body and spool.

#### NOTE

Grease handle, socket & hole in stop prior to assembly.



## Model Code



1 D - Directional control valve  
G - Subplate mounting

2 Lever operated

3 Rated pressure

V - 350 bar (5075 psi)

4 Interface

3 - ISO 4401-03 (CETOP 3 & NFPA D03)

5 Spool type (see table)

6 Spool/Spring arrangement

A - Spring offset, to cylinder "A"

C - Spring centered

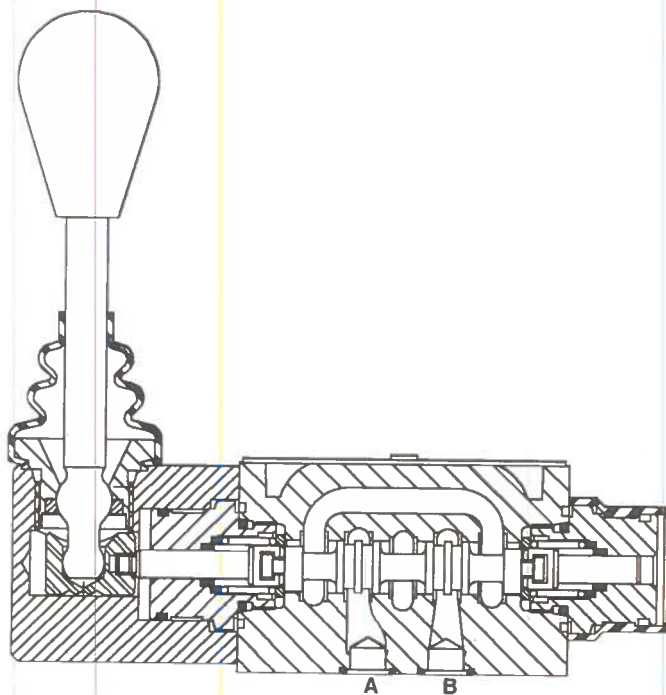
N - No spring detented

7 Build type

L - Left hand build (lever on "B" port side of valve)

Omit - Right hand build (lever on "A" port side of valve)

8 Design



Typical sectional view

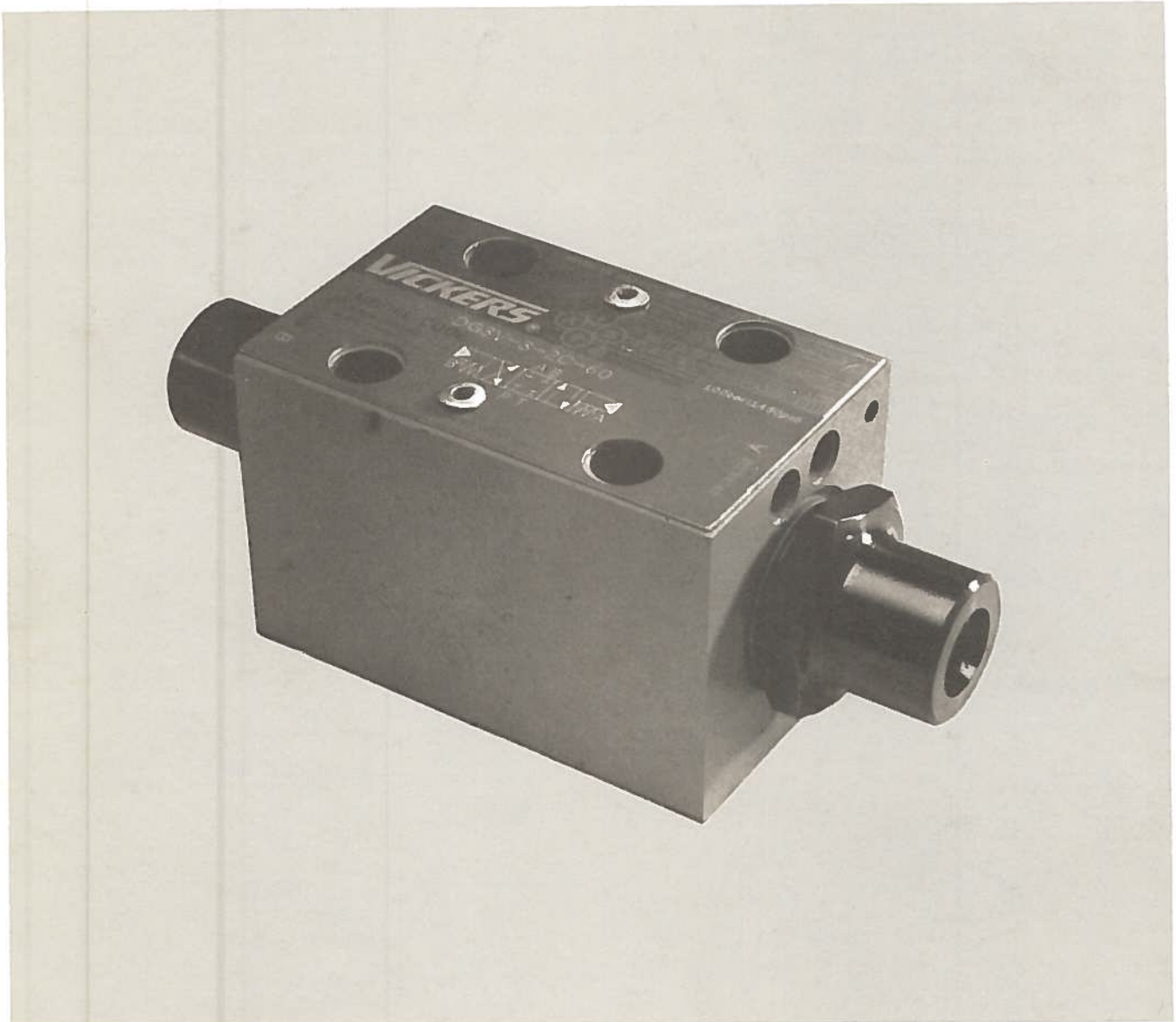
# VICKERS

A TRIMINOVA Company

Vickers Incorporated  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.

# Hydraulically Operated Directional Control Valve

DG3V-3- \*\* \*(L)-(T)-(P1)-7-\*-60



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.



SPOOL/SPRING ARRANGEMENT	DRAIN TYPE	
	INTERNAL	EXTERNAL
	SPOOL NO.	SPOOL NO.
□ 0A	694537	694492
0B	694540	694435
0C	—	694435
0F	694540	—
0N	—	694494
□ 2A	694538	698839
2B	694541	698841
2C	—	698841
2F	694541	—
2N	—	698842
◆ 3B	694542	694436
◆ 3C	—	694436
◆ 3F	694542	—
□ 6A	694539	694493
6B	694543	694437
6C	—	694437
6F	694543	—
6N	—	694495
◇ 0	—	694492
◇ 2	—	698839
◇ 6	—	694493
33B	694544	694438
33C	—	694438
33F	694544	—

#### SPOOL ASSEMBLY NOTES

- Assemble spools with narrow end land towards A port end of body (Reverse for left hand builds)
- ◆ Assemble type 3 spool with narrow center land toward "A" port
- ◇ Blank - no spring required (refer to model code breakdown)

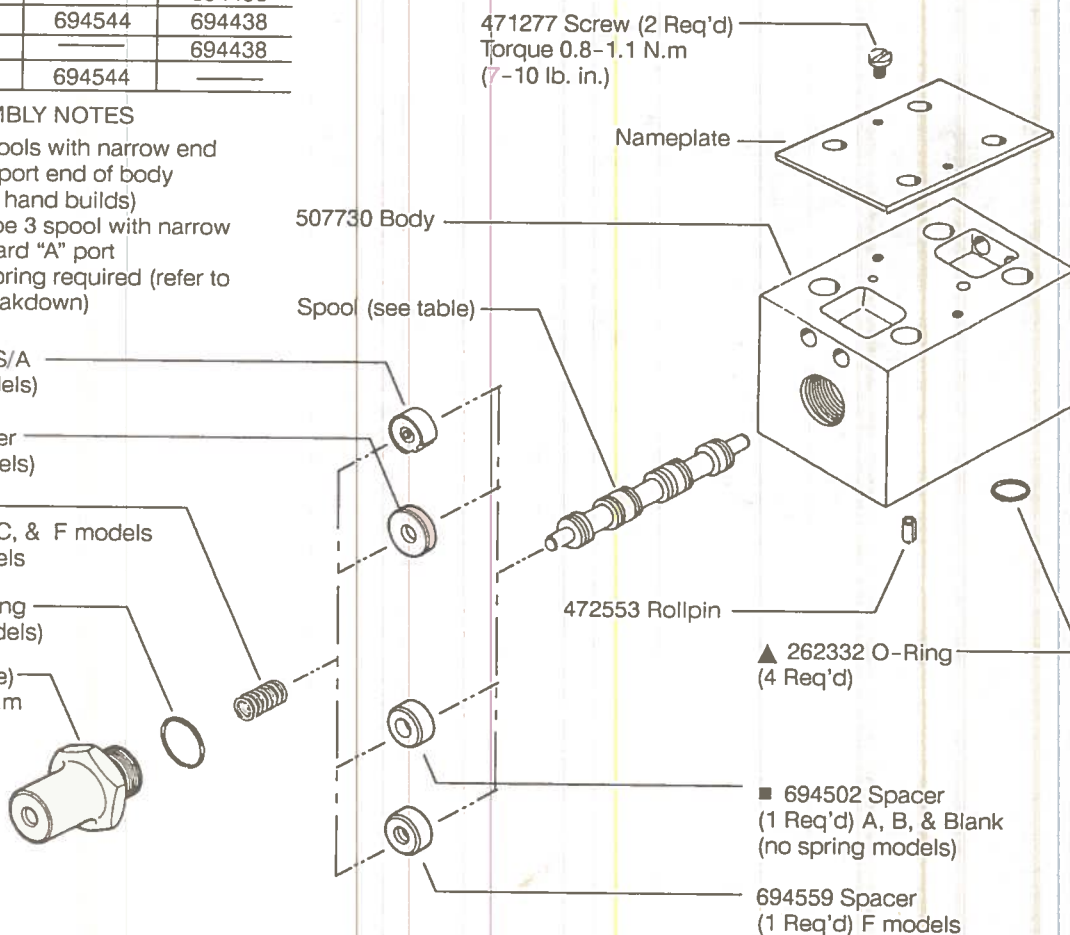
697386 Detent S/A  
(2 Req'd N models)

■ 694545 Spacer  
(2 Req'd C models)

507889 Spring  
(2 Req'd) A, B, C, & F models  
Omit for N models

▲ 262353 O-Ring  
(2 Req'd all models)

● Plug (see table)  
Torque 30-36 N.m  
(22-27 lb.ft.)



#### NOTE:

For satisfactory service life of these components in industrial applications, use full flow filtration to provide fluid which meets ISO cleanliness code 18/15 or cleaner. OFP, OFR, and OFRS series filters are recommended.

MODEL	● PLUG (qty.)
DG3V-3-**-7-B-60	694535 (2)
DG3V-3-**-7-S-60	694536 (2)
DG3V-3-**A-7-B-60	694535 (2)
DG3V-3-**A-7-S-60	694536 (2)
DG3V-3-**A-T-7-B-60	694535 (1)
DG3V-3-**A-T-7-S-60	694536 (1)
DG3V-3-**A-T-P1-7-B-60	694535 (1)
DG3V-3-**A-T-P1-7-S-60	694536 (1)
DG3V-3-**B-7-B-60	694536 (2)
DG3V-3-**B-7-S-60	694536 (2)
DG3V-3-**B-T-7-B-60	694535 (2)
DG3V-3-**B-T-7-S-60	694536 (2)
DG3V-3-**B-T-P1-7-B-60	694535 (1)
DG3V-3-**B-T-P1-7-S-60	694536 (1)
DG3V-3-**C-7-B-60	694535 (2)
DG3V-3-**C-7-S-60	694536 (2)
DG3V-3-**F-T-7-B-60	694535 (1)
DG3V-3-**F-T-7-S-60	694536 (1)
DG3V-3-**F-T-P1-7-B-60	694535 (1)
DG3V-3-**F-T-P1-7-S-60	694536 (1)
DG3V-3-**N-7-B-60	694505 (2)
DG3V-3-**N-7-S-60	694557 (2)

▲ Available in seal kit 02-110959

■ Recessed side of spacer to mate with spool end land

507724 End cap (Internal drain models)  
Torque 30-36 N.m (22-26 lb. ft.)

■ 694545 Spacer  
(A & B models)

694558 Spacer  
(F models)

694500 End cap  
Torque 30-36 N.m  
(22-26 lb. ft.)

▲ 262326 O-Ring

694501 Plunger

■ 694545 Spacer  
(A, B, & C models)

694558 Spacer  
(F models)

**Internal drain models**  
DG3V-3-\*\*\*A-T-7-\*-60  
DG3V-3-\*\*\*B-T-7-\*-60  
DG3V-3-\*\*\*F-T-7-\*-60

Refer to other end of valve for balance of part numbers, except as noted

**External drain models**  
DG3V-3-\*\*\*A-7-\*-60  
DG3V-3-\*\*\*B-7-\*-60

Refer to other end of valve for balance of part numbers, except as noted

**External drain model**  
DG3V-3-\*\*\*C-7-\*-60

Refer to other end of valve for balance of part numbers

**External drain model**  
DG3V-3-\*\*\*N-7-\*-60

Refer to other end of valve for balance of part numbers

**External drain model (Blank no spring)**  
DG3V-3-\*\*\*-7-\*-60

Refer to other end of valve for balance of part numbers, except as noted

694559 Spacer (Use on Blank models only. Assemble next to spring with rounded face towards spool.)

**Manual override option (A, B, & F models only, in non-operator end)**

DG3V-3-\*\*\*A-T-P1-7-\*-60  
DG3V-3-\*\*\*B-T-P1-7-\*-60  
DG3V-3-\*\*\*F-T-P1-7-\*-60

Refer to other end of valve for balance of part numbers, except as noted

#### VALVE ASSEMBLY NOTE:

Right hand assembly shown for all single operator models.

For left hand assembly all parts are reversed except body.

For left hand assembly, external drain B models all parts are reversed except body and spool.

## Model Code

<b>D</b>	<b>G</b>	<b>3</b>	<b>V</b>	<b>-3-</b>	<b>**</b>	<b>*</b>	<b>(L)</b>	<b>-</b>	<b>(T)</b>	<b>-</b>	<b>(P1)</b>	<b>-</b>	<b>7</b>	<b>-*</b>	<b>- 60</b>
1	2	3	4	5	6	7	8	9	10	11	12	13			

**1** Directional control valve

**2** Subplate/Manifold mounted

**3** Hydraulically operated

**4** Rated pressure

V - 350 bar (5000 psi) on P, A & B Ports

**5** Interface ISO 4401-AB-03-4-B

3 - NFPA D01, ISO 4401-03, Cetop 3 (with location pin)

**6** Spool type

0 - Open center (all ports) (all models)  
 2 - Closed center (all ports) (all models)  
 3 - Closed center (P & B ports) (B, C, F models only)  
 6 - Closed center (P port only) (all models)  
 33 - Closed center (bleed A & B ports) (B, C, F models only)

**7** Spool/Spring arrangement

Blank - No spring  
 A - Spring offset (Single operator)  
 B - Spring centered (Single operator)  
 C - Spring centered  
 F - Spring offset, shift to center  
 N - No-spring detented

**8** Left hand build

(Omit if not required)  
 L - Left hand build A, B & F models only

**9** Internal drain

(Omit if not required)  
 T - Internal drain, (required on F models available on A & B models)

**10** Manual override

(Omit if not required)  
 P1 - Manual override (A, B, & F models only in non-operator end) Internal drain only

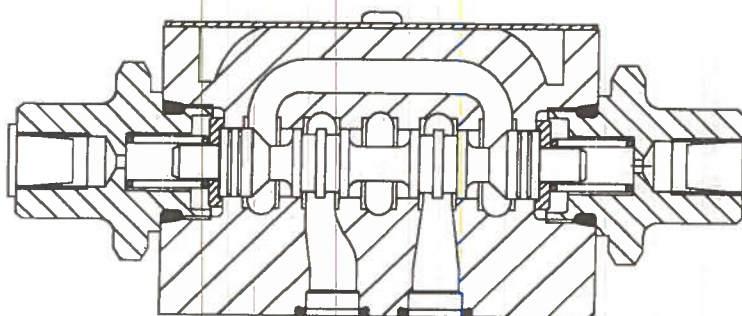
**11** Tank pressure limit

7 - 7 - 210 bar

**12** Thread for pilot/drain connection

B - G 1/8" threads  
 S - SAE internal straight thread

**13** Design

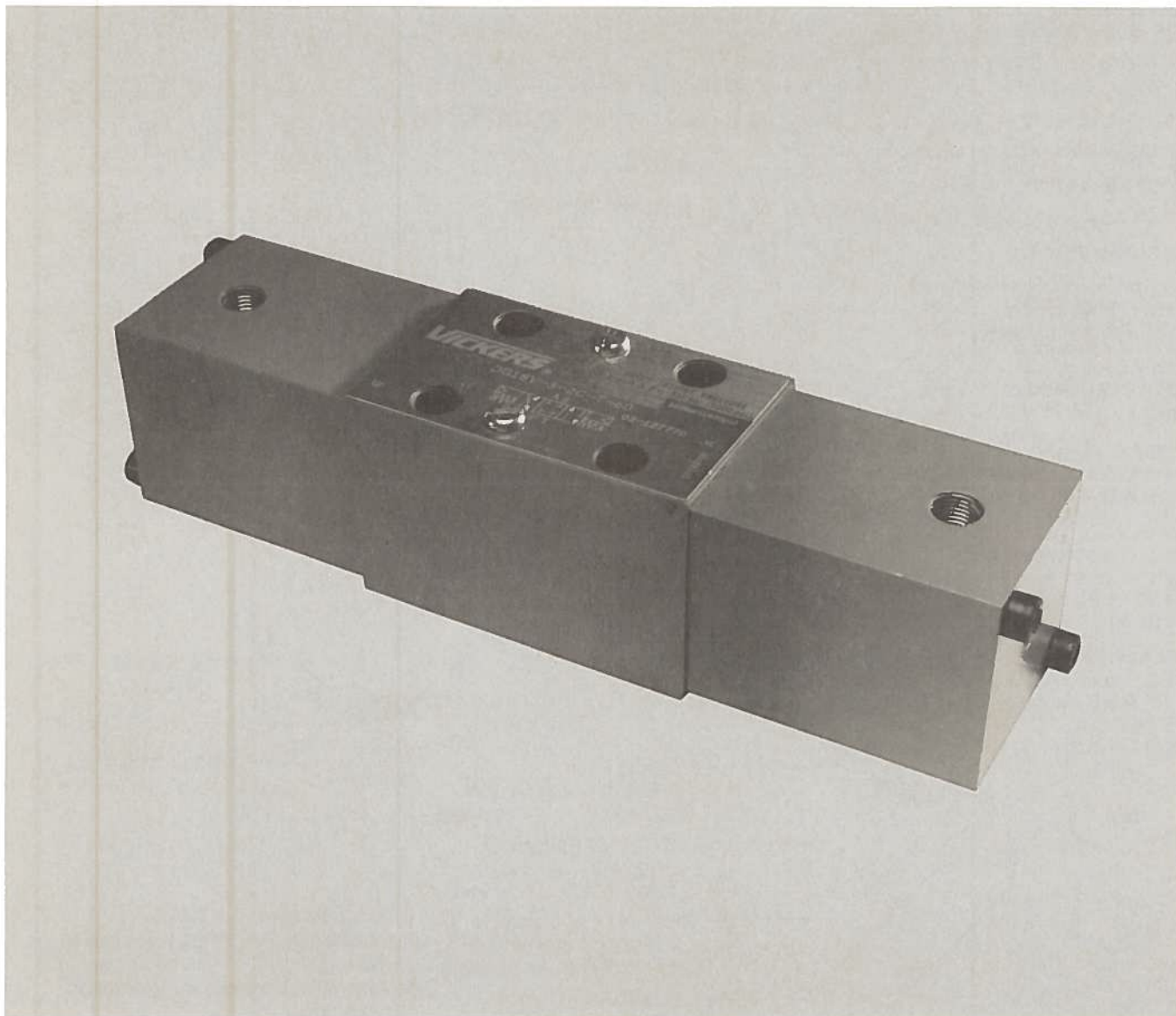


Sectional view, spring centered valve

## Air Pilot Operated Directional Control Valve

DG18V-3-\*A/B/F(L)-(P2)-(V)-\*-60

DG18V-3-\*C/N-(V)-\*-60



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.



Spool Type	Model	Spool
* O	A	617498
	B, C, F	617121
	N	890189
** 1, 11	B, C, F	458263
* 2	A	617120
	B, C, F	617118
	N	617126
**** 22	A	617122
*** 3, 31	B, C, F	617124
33	B, C, F	617123
* 6	A	890188
6	B, C, F	617119
	N	617341
**** 7	A	458151
7	B, C, F	617125
	B, C, F	458950

#### SPOOL ASSEMBLY NOTE:

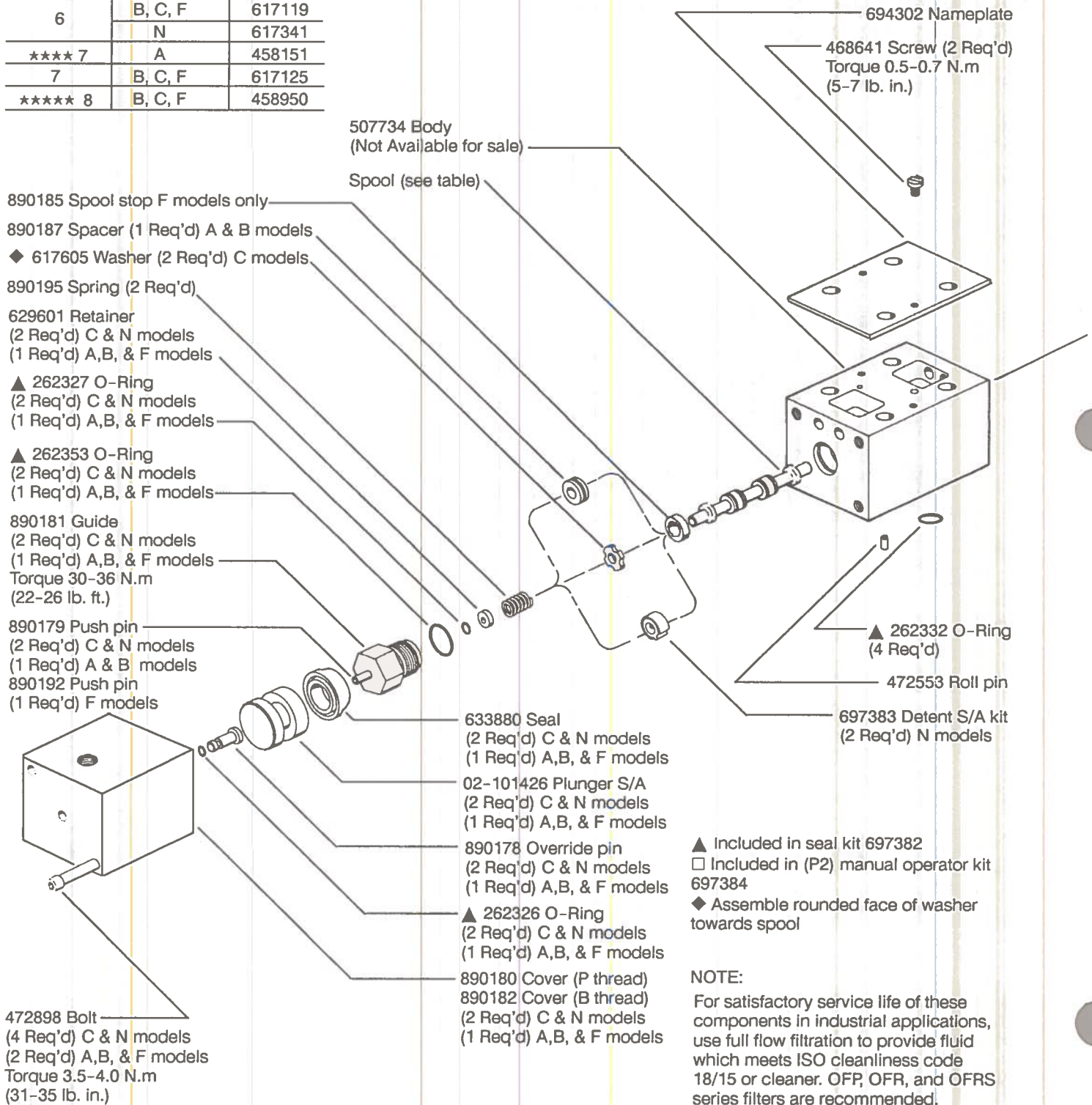
\* Assemble type "OA", "2A", and "6A" spool in body with longer end land opposite of operator.

\*\* Assemble type "1" spool in body with narrow center land towards "A" port. Assemble type "11" spool in body with narrow center land towards "B" port.

\*\*\* Assemble type "3" spool in body with narrow center land towards "A" port. Assemble type "31" spool in body with narrow center land towards "B" port.

\*\*\*\* Assemble type "7A" and "22A" spool in body with reduced longer end Dia. towards operator.

\*\*\*\*\* "V" Option, operator "A" is at port "A" end of valve and/or operator "B" is at port "B" end of valve, independent of spool type. Type 8 spool valves will always have a "V" present in model code.



507724 End cap  
Torque 30-36 N.m  
(22-26 lb. ft.)

▲ 262353 O-Ring

890195 Spring (Ref.)

◆ 617605 Washer

DG18V-3-\*A-60 Refer to opposite end  
for balance of part numbers.

507724 End cap  
Torque 30-36 N.m  
(22-26 lb. ft.)

▲ 262353 O-Ring

890195 Spring (Ref.)

◆ 617605 Washer

DG18V-3-\*B-60 Refer to opposite end  
for balance of part numbers.

DG18V-3-\*C-60 Refer to opposite end  
for part numbers

DG18V-3-\*F-60 Refer to opposite end for  
balance of part numbers.

507724 End cap  
Torque 30-36 N.m  
(22-26 lb. ft.)

▲ 262353 O-Ring

890195 Spring (Ref.)

◆ 617605 Washer

890186 Spacer

DG18V-3-\*N-60 Refer to "C" layout for  
part numbers

#### VALVE ASSEMBLY NOTE:

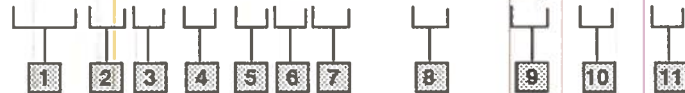
Right hand assembly shown for all single  
operator models.

For left hand assembly, DG18V3-\*A-(P2),  
all parts are reversed except body.

For left hand assembly, DG18V3-\*B-(P2)  
and DG18V3-\*F-(P2), all parts are  
reversed except body and spool.

# Model Code

D G 18 V -3- \* \* (L) - (P2) - (V) -\* - 60



**1** Directional control valve, subplate mounted

**2** Air pilot operated

**3** Rated pressure

350 bar (5000 psi)

**4** Interface

ISO 4401-03 (CETOP 3, NFPA D03)

**5** Spool type (Center condition)

- 0 - Open center (All ports)
- 1 - Open center (P & A to T)
- 2 - Closed center (All ports)
- 3 - Closed center (P & B)
- 6 - Closed center (P only)
- 7 - Open center (T blocked)
- 8 - Tandem center (P to T)
- 11 - Open center (P & B to T)
- 22 - Closed center (Two-way)
- 31 - Closed center (P & A)
- 33 - Closed center (Bleed A & B)

**6** Spool spring arrangement

- A - Spring offset to CLY. A, (Single operator)
- B - Spring centered, (Single operator)
- C - Spring centered (Dual operator)
- F - Spring offset, to CLY. A, shift to center (Single operator)
- N - No-spring, detented

**7** Build type

- L - Left hand build (Single operator only)
- Blank - Standard right hand build (Single operator only)

**8** Manual override option

- P2 - Manual operator in end cap, (single operators) (Applicable for A(L), B(L) & F(L) models only)
- Blank - Overrides in operator end only

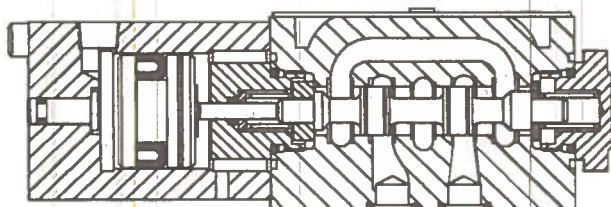
**9** Actuator identity

V - Actuator identifier included for all type 8 spools (Refer to spool assembly note \*\*\*\*\*)

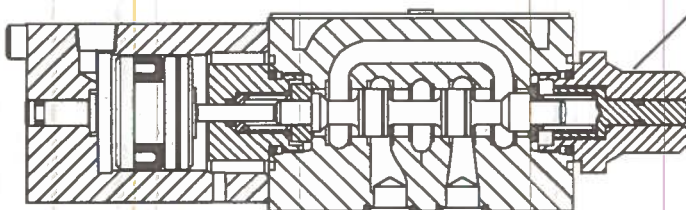
**10** Thread connection type

- P - 1/8" NPT threads
- B - 1/8 BSP threads

**11** Design number

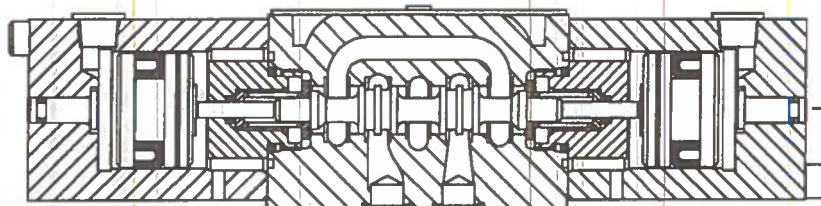


DG18V-3-\*A-\*-60 Typical spring offset valve / single operator



□ 507971 Plug & pin S/A  
Torque 30-36 N.m (22-26 lb. ft.)

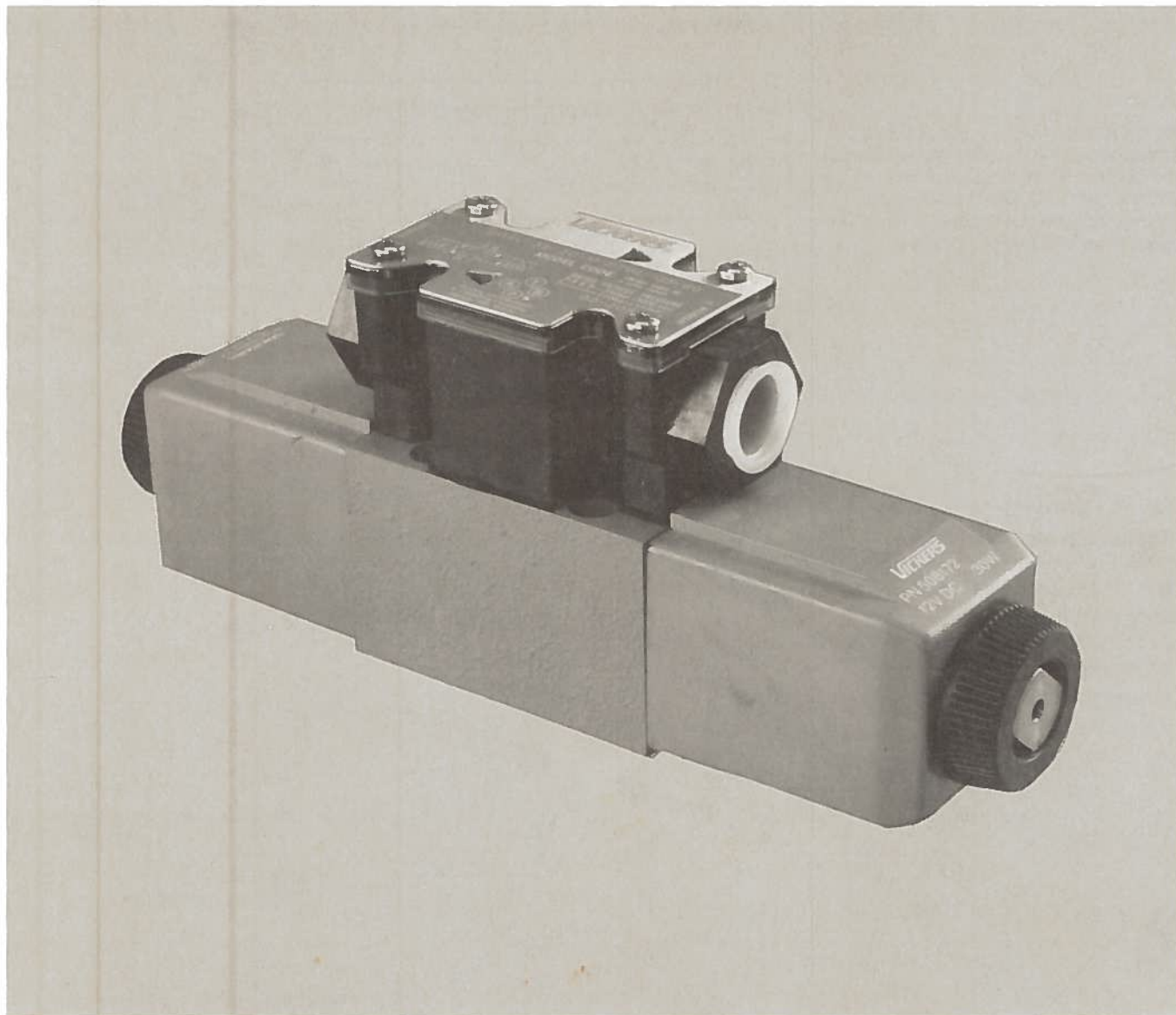
DG18V-3-\*\*-P2-\*-60 With manual operator in end cap / single operator



DG18V-3-\*C-\*-60 Typical spring centered valve / dual operator

## Cetop 3 Size Proportional Directional Control Valves

KD/TG4V-3S-\*B/C/F(L)-\*\*-\*- (V)M-\*\*\* (I)-\*5-60-(EN\*\*)



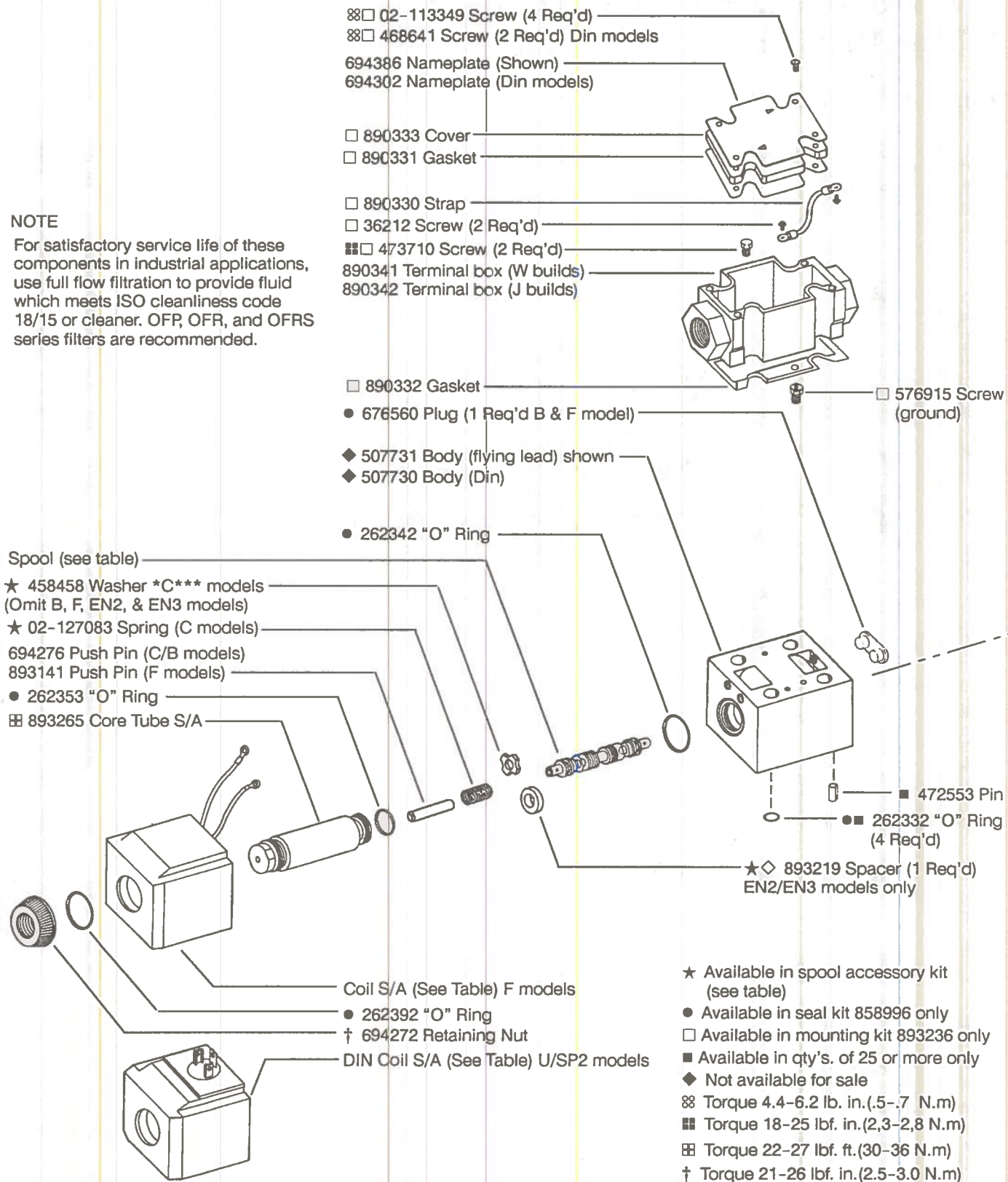
Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.



COIL- LETTER	COIL S/A F MODELS	COIL S/A U MODELS	COIL S/A SP2 MODELS
G	02-134567	02-134569	
GP	508172	507847	02-111166
H	02-134568	02-134570	
HA	508173	507848	02-111168

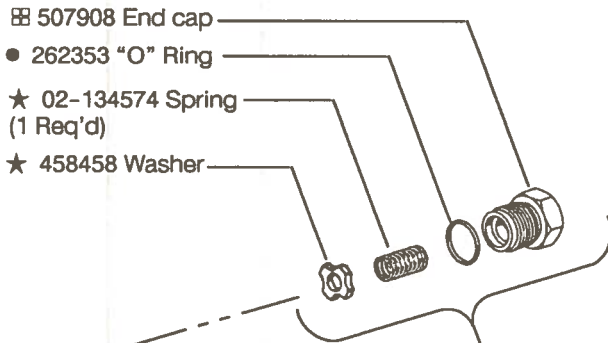
#### NOTE

For satisfactory service life of these components in industrial applications, use full flow filtration to provide fluid which meets ISO cleanliness code 18/15 or cleaner. OFP, OFR, and OFRS series filters are recommended.



# NOTE

See service drawing I-3886-S for options not shown.

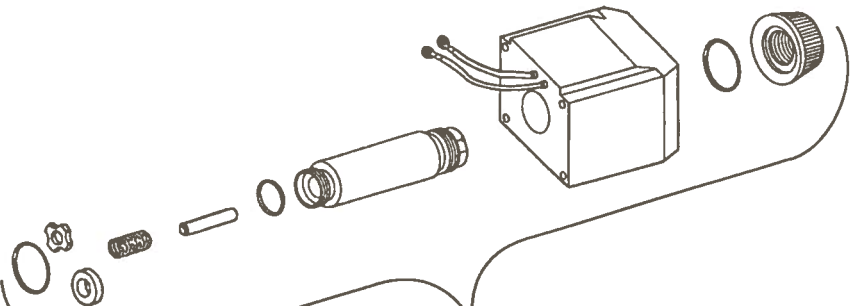


## NOTE

**KTG4V-3S-\*B(L)\*\*-(V)M-FW-60**  
Spring Centered, Sol. "A" Removed  
Refer to other end of valve for common part numbers except as noted.

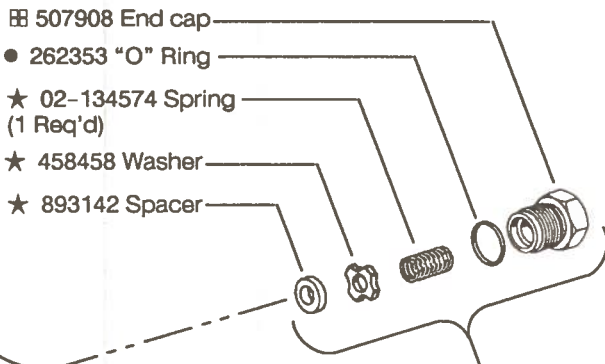
## NOTE

Right hand assembly shown for all single solenoid valves, for left hand assembly all parts are reversed except body.



## NOTE

**KDG4V-3S-\*C\*N-(V)M-FW-60-(EN2/3)**  
**KDG4V-3S-\*C\*\*-(V)M-FW-60-(EN4)**  
Spring Centered, Dual Solenoid  
Refer to other end of valve for common part numbers except as noted.



## NOTE

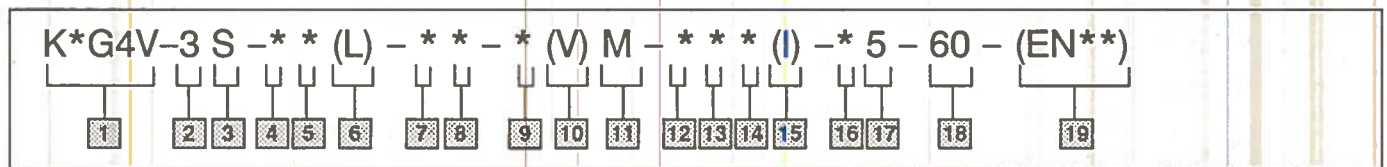
**KTG4V-3S-\*F(L)\*\*-(V)M-FW-60**  
Spring offset to CYL. "A", shift to center  
Refer to other end of valve for common part numbers except as noted.

## SPOOL NOTES

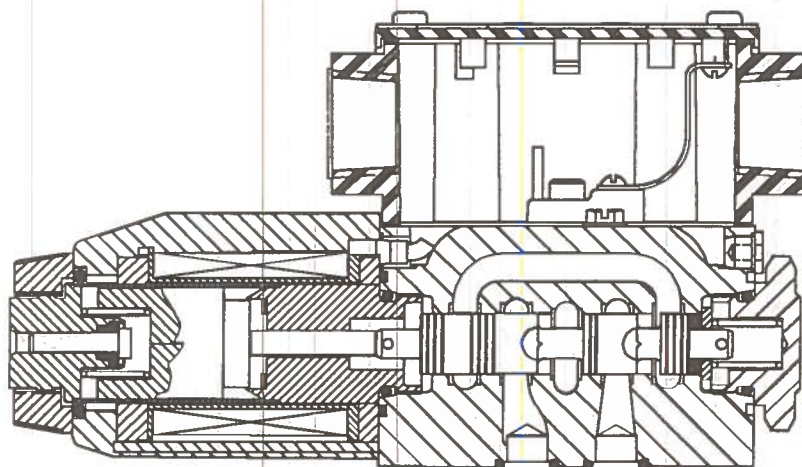
- ☆ Assemble type 2C15S-EN4 spool with long land over "A" port.
- ◇ Assemble spacer 893219 on "A" port end for 3C15N-EN2 spool and on "B" port end for 131C15N-EN3 spool.
- Assemble spool with notched land over "A" port for both EN2 and EN3 models.
- ♠ Assemble spool with long land over "B" port.
- ⌘ Assemble spool with long land over "A" port.

MODEL	SPOOL	TYPE	SPOOL ACCESSORY KIT
-*C***	893131	2C19S	697373
	893132	2C19N	
	893127	2C08S	
	893128	2C08N	
	893129	2C15S	
	893130	2C15N	
	893138	33C08A	
	893139	33C15A	
	893220	33C22A	
	893134	☆ 2C15S-EN4	
-*B**N	893133	◇ 3C15N-EN2	697376
	893133	◇ 131C15N-EN3	
	893137	♠ 2*19N	
-*F**N	893136	♠ 2*08N	697374
	893221	♠ 2*15N	
	893137	⌘ 2*19N	697375
-*F**N	893136	⌘ 2*08N	
	893221	⌘ 2*15N	

# Model Code



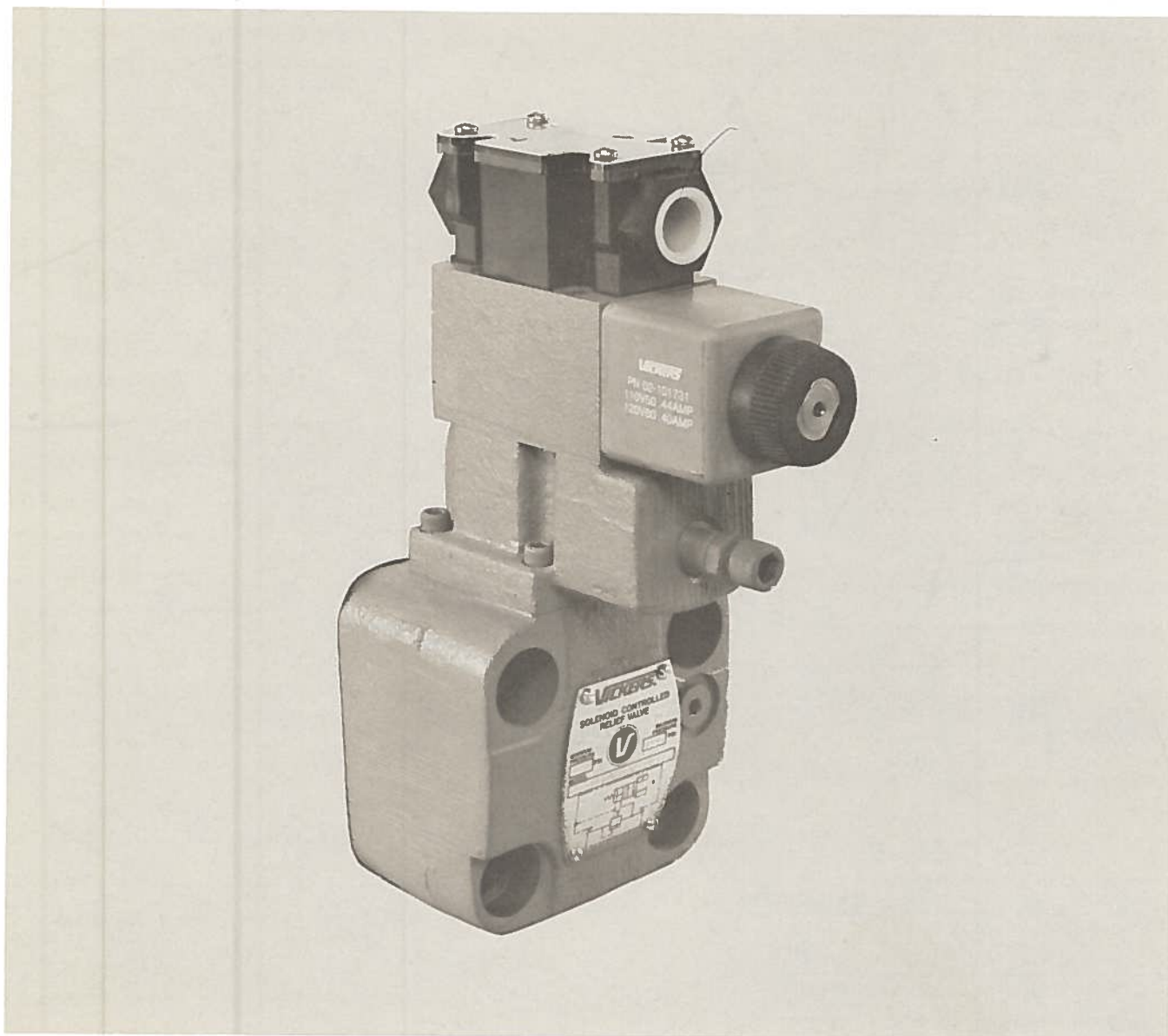
- |  |  |  |
|--|--|--|
| <p><b>1 K - Proportional</b><br/> <b>D - Directional control valve</b><br/> <b>T - Throttle valve</b><br/> <b>G - Subplate mounted</b><br/> <b>4 - Solenoid operated</b><br/> <b>V - 350 Bar (5075 psi) P, A, &amp; B ports</b></p> <p><b>2 Interface</b><br/> <b>3 - ISO-4401-03 CETOP 3 (NFPA D03)</b></p> <p><b>3 Standard performance</b><br/> <b>S - Standard performance</b></p> <p><b>4 Spool type (see table)</b></p> <p><b>5 Spool/Spring arrangement</b><br/> <b>B - Spring centered, sol. A removed</b><br/> <b>C - Spring centered, dual solenoid</b><br/> <b>F - Spring offset to cyl. A, shift to center</b></p> <p><b>6 Build type</b><br/> <b>L - Left hand build single solenoid models only</b><br/> <b>Blank - Standard right hand build</b></p> <p><b>7 Spool flow rating (@ 10 bar (145 psi) pressure drop)</b><br/> <b>08 - 8 L/min. (2 USgpm)</b><br/> <b>15 - 15 L/min. (4 USgpm)</b><br/> <b>19 - 19 L/min. (5 USgpm)</b></p> | <p><b>8 Metering condition</b><br/> <b>S - Meter-out (only)</b><br/> <b>A - Meter-in (only)</b><br/> <b>N - Meter-in and Meter-out</b></p> <p><b>9 Manual override options</b><br/> <b>Blank - Plain override solenoid ends only</b><br/> <b>H - Waterproof override solenoid end only</b><br/> <b>P2 - Plain override both ends of single solenoid models</b></p> <p><b>10 Solenoid Identification (models with EN2, EN3 or EN4 require V in model code for reverse solenoid identification)</b></p> <p><b>11 Flag</b><br/> <b>Electrical options &amp; features (refer to service drawing I-3886-S)</b></p> <p><b>12 Coil type</b><br/> <b>F - Flying lead</b><br/> <b>U - DIN 43650</b><br/> <b>SP1 - Single 6.3 mm series spade to IEC 760 (Direct D.C. models only)</b><br/> <b>SP2 - Dual 6.3 mm series spade to IEC 760 (Direct D.C. models only)</b></p> | <p><b>13 Electrical connections (F type coil only) omit if not required</b><br/> <b>T - Wired terminal block</b><br/> <b>PA - Instaplug male receptacle only</b><br/> <b>PB - Instaplug male &amp; female receptacle</b><br/> <b>PA3 - Three pin connector</b><br/> <b>PA5 - Five pin connector</b></p> <p><b>14 Housing (F type coils only)</b><br/> <b>W - 1/2 NPT thread wiring housing</b><br/> <b>J - 20 mm thread wiring housing</b></p> <p><b>15 Electrical Options (omit when not required)</b><br/> <b>I - ISO 4400 with fitted plug (U models only)</b></p> <p><b>16 Coil Identification letter (see table)</b></p> <p><b>17 Tank pressure rating</b><br/> <b>5 - 100 Bar (1450 psi)</b></p> <p><b>18 Design</b></p> <p><b>19 Special modifications (omit if not required)</b></p> |
|--|--|--|



Typical sectional view, KTG4V-3S-\*(L)\*\*-(V)M-FW-\*(5-60 spring offset valve.

# Solenoid Controlled Pilot Operated Relief Valves

(F3)-C/G/S/T5-(H)-03/06\*\*\* (V)\*\*(V)-M-(S\*)\*\*\*\*\* (L)\*\*\*\*\*-100/110-EN\*\*



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.



**\* NOTE**

On CG5-(H)0\*\*\*C-\*(V)-100/110 dual solenoid models, pilot valve & cover S/A are rotated 90° clockwise from body. Refer to pilot valve drawing for parts breakdown.

\* Pilot Valve (See Table)  
(DG4V-3(S)-\*C-60 Shown)

▲ 232332 'O'Ring (4 Req'd)

▲ 263497 'O'Ring

■ 329463 Plug  
Torque 53-58 N.m.  
(39-43 lb. ft.)

■ 285601 Seat

Assemble 285601 seat with cross hole facing up as shown.

▲ 262361 'O'Ring

Inner Spring (See Table)

Outer Spring (See Table)

343154 Piston

Seat (See Table)

Sleeve ('H' High Flow Models Only)  
(See Table)

696892 Bolt Kit (Includes 4 Bolts)  
Torque 5.6 N.m. (50 lb. in.) Maximum

68905 Washer (4 Req'd)

1031 Screw (4 Req'd)  
Torque 14.5-20.4 N.m. (11-15 lb. ft.)

■ Cover (See Table)

■ 343704 Plug &  
▲ 263494 'O'Ring (See Table)

■ 398071 Plug &  
▲ 263492 'O'Ring (See Table)

⊕ ◆ 292230 Screw

■ 326317 Shim  
(As req'd to obtain proper adj. range)

■ 1485 Locknut

⊕ ◆ 283949 Retainer

■ 64520 Washer

■ 283948 Plunger

▲ 262332 'O'Ring

■ Washer (See Table)

■ 422849 Spacer

■ Cover Spring  
(See Table)

■ 290057 Piston

MODEL	SEAT	SLEEVE
C*5-03/06	343153	—
C*5-H06	589473	589472

MODEL	■ COVER S/A
C*5-(H)0*0A/F-B(V)-100/110	942432
C*5-(H)0*0A/F-C(V)-100/110	942433
C*5-(H)0*0A/F-F(V)-100/110	942434
C*5-(H)0*1A-B(V)-100/110	942435
C*5-(H)0*2A-B(V)-100/110	
C*5-(H)0**C-B(V)-100/110	
C*5-(H)0*1A-C(V)-100/110	942436
C*5-(H)0*2A-C(V)-100/110	
C*5-(H)0**C-C(V)-100/110	
C*5-(H)0*1A-F(V)-100/110	942437
C*5-(H)0*2A-F(V)-100/110	
C*5-(H)0**C-F(V)-100/110	

▲ 263494 'O'Ring

343740 Plug  
Torque 15.0-16.6 N.m.  
(133-147 lb. in.)

Diagram Plate  
(See Table)

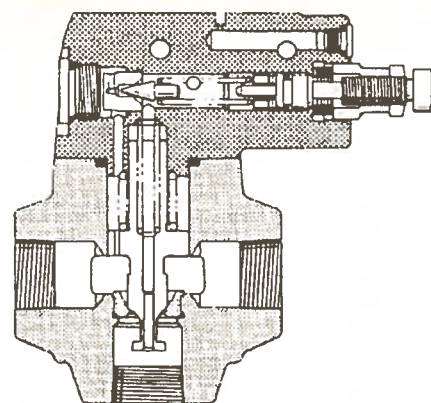
AX-36212 Screw  
(4 Req'd)

◆ Body (See Table)

MODEL	◆ BODY
CS5-03**-*-100/110	590407
CS5-(H)06**-*(V)-100/110	581701
CT5-06**-*-100/110	590348

MODEL	DIAGRAM PLATE	* PILOT VALVE
C*5-(H)0*0A(P)-*(V)-M-***-100	422864	DG4V-3S-0BL-M***-60
C*5-(H)0*0A(P)-*(V)-M-***-110		DG4V-3-0BL-M***-60
C*5-(H)0*1A(P)-*(V)-M-***-100	422865	DG4V-3S-2AL-M***-60
C*5-(H)0*1A(P)-*(V)-M-***-110		DG4V-3-2AL-M***-60
C*5-(H)0*2A(P)-*(V)-M-***-100	423814	DG4V-3S-2BL-M***-60
C*5-(H)0*2A(P)-*(V)-M-***-110		DG4V-3-2BL-M***-60
C*5-(H)0*0C-*(V)-M-***-100	422862	DG4V-3S-0C-M***-60
C*5-(H)0*0C-*(V)-M-***-110		DG4V-3-0C-M***-60
C*5-(H)0*2C-*(V)-M-***-100	422863	DG4V-3S-2C-M***-60
C*5-(H)0*2C-*(V)-M-***-110		DG4V-3-2C-M***-60
C*5-(H)0*0F(P)-*(V)-M-***-100	477211	DG4V-3S-0FL-M***-60
C*5-(H)0*0F(P)-*(V)-M-***-110		DG4V-3-0FL-M***-60

\* Refer to pilot valve drawing for parts breakdown.



Relief valve sectional view without pilot valve

MODEL	■ COVER	■ PLUG/'O'RING (2 REQ'D)	■ PLUG/'O'RING
C*5-(H)0*0A-100/110	422828	—	—
C*5-(H)0*1A-100/110	424203	343740/▲ 263494	398071/▲ 263492
C*5-(H)0*2A-100/110			
C*5-(H)0**C-100/110			

MODEL	■ WASHER	INNER SPRING	OUTER SPRING	■ COVER SPRING
C*5-0***-B-100/110	—	2077	—	2280
C*5-H0***-BV-100/110		—	184458	
C*5-0***-C-100/110	233110	2077	—	583937
C*5-H0***-CV-100/110		—	184458	
C*5-0***-F-100/110	—	2077	—	2281
C*5-H0***-FV-100/110		—	184458	

■ Included In Cover S/A

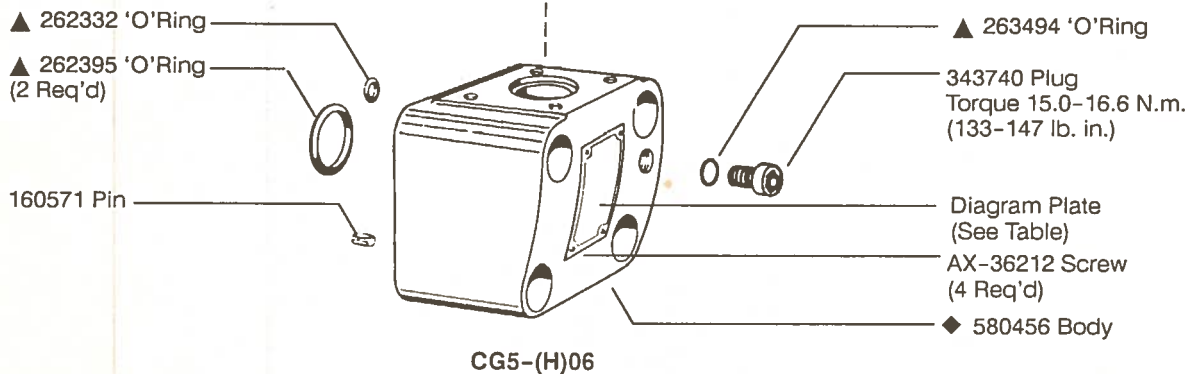
⊕ Lubricate With Oil Before Assembly

▲ Included In F3 Seal Kit 696929  
(includes pilot valve seals)

◆ Not Available For Sale

#### NOTE

Parts Prefixed With A Symbol Available  
Only In Kits.



# Model Code

(F3)		-	C	*	5	-(H)	**	*	*	*	-	*	(V)	**	(V)	-	M	-(S*)	-	*	*	*	*	(L)	-	*	*	*	*	*	-	100/110	-	EN	**
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24											

**1** Seals for mineral oil & fire resistant fluids

**2** Relief valve

**3** Connections

G - Subplate mounting

S - Straight threads

T - NPTF threads

**4** Solenoid controlled

**5** High flow  
Omit for standard models

**6** Valve size

03 - 3/8"-.8750 straight thread  
06 - 3/4"-1.0625 straight thread  
or 3/4" NPTF

**7** Pilot spool function

0,1, or 2 Indicates venting condition

**8** Pilot spool spring arrangement

A - Spring offset

C - Spring centered

F - Spring centered, shift to center

**9** Pressure range

B - 125-1000 psi

C - 500-2000 psi

F - 1500-3000 psi

**10** High vent (Req'd for high flow models)

Blank - Omit for low vent models

**11** Manual override options (included in pilot valve model code)

Blank - Plain override solenoid ends only

H - Waterproof override solenoid ends only

H2 - Waterproof override both ends of single solenoid

M - Serviceable manual overrides in solenoid ends only

P2 - Plain override both ends of single solenoid

Y - Lockable manual overrides solenoid ends only

Z - No overrides in either end

**12** Solenoid energization identity

Blank - Standard arrangement for ANSI B93.9 (energise solenoid A for flow P to A port)

V - Solenoid identification determined by position of solenoid. (Solenoid A at port A end and/or solenoid B at port B end. (All 4 & 8 spools are always V code)

**13** Flag symbol heading electrical options & features

**14** Spool position monitoring switch (tank pressure rating 10 bar only)

S1 - Switch, normally open, U coils only

S2 - Switch, normally closed, U coils only

S3 - Switch, wired normally open, P\*

S4 - Switch, wired normally closed, P\*

S5 - Switch, free leads, FW & FJ only

**15** Coil type

U - ISO 4400

F - Flying lead

SP1 - Single 6,3 series spade to IEC 760

SP2 - Dual 6,3 series spade to IEC 760

**16** Electrical connections (F type coil only) omit if not required

T - Wired terminal block

PA - Instaplug male receptacle only

PB - Instaplug male & female receptacle

PA3 - Three pin connector

PA5 - Five pin connector

**17** Housing (F type coils only)

W - 1/2 NPT thread wiring housing

J - 20 mm thread wiring housing

**18** Electrical options

1 - ISO with fitted plug, U type coils only

6 - ISO with fitted plug, with lights, U type coils only

**19** Solenoid indicator lights (F build only) To be used with T terminal block models. (Omit if not required)

**20** Coil Identification

**21** Pilot valve code (tank pressure rating)

2 - 10 bar (145 psi) use with switch models S\*

5 - 100 bar (1450 psi) DG4V-3S-60

6 - 160 bar (2300 psi) DG4V-3-60

7 - 210 bar (3000 psi) DG4V-3-60

**22** Pilot valve port orifices

**23** Design

100 - DG4V3S-60

Standard pilot valve

110 - DG4V3-60

High performance pilot valve

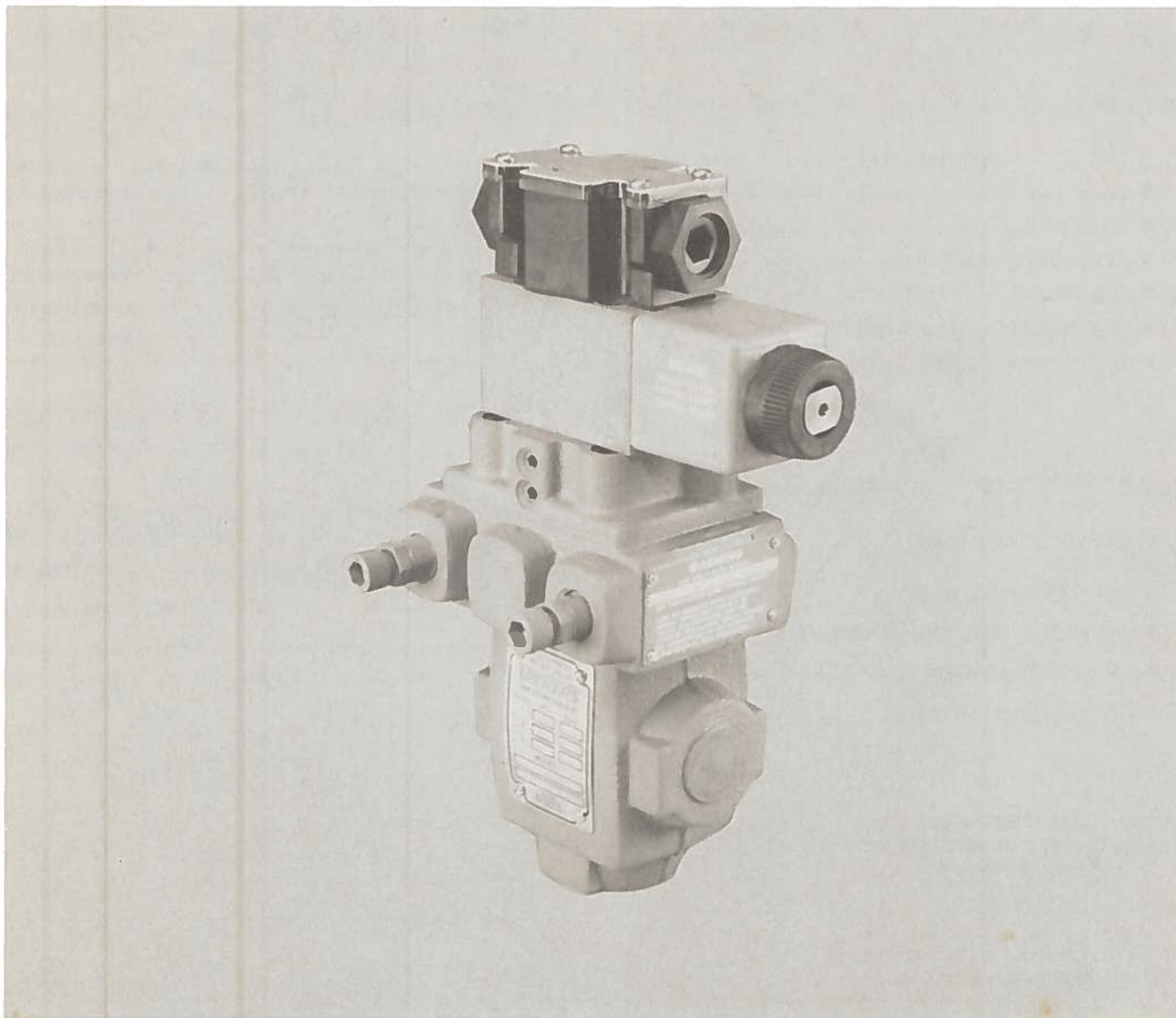
**24** Special modifications (omit if not required)

**11** Thru **22** included in pilot valve model code



## Multi-Pressure Relief Valves

(F3)-C/G/S/T-06/10\*\*(\*)(V)-DG-OA(L)\*\*-(V)M-(S\*)\*\*\*\*\* (L)\*\*\*\*\*-40/50



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.



NOTE: Lubricate all parts & seals with a thin coat of oil at assembly.

DG4V3(S)-OA(L)-60 Pilot valve (Refer to parts drawing for detailed information).

255698 Bolt kit (Torque 4.5-5.6 N.m.)  
40-50 lb.in. (Pilot valve to adapter plate mounting) Not shown

255651 Bolt kit (Torque 14.9-20.3 N.m.)  
11-15 lb.ft. (Adapter plate to cover mounting)

422814 Adapter plate

▲ 113000 Plug (4 Req'd)

△▲ 262334 "O"Ring (4 Req'd)

○● Cover (see table)

○● 290057 Piston (2 Req'd)

○● Cover spring (see table)

○●△▲ 262332 "O"Ring (2 Req'd)

○●△▲ 197570 BU-Ring (2 Req'd)

○● 370701 Plunger (2 Req'd)

○● \*▲ 292230 ADJ. screw (2 Req'd)

○● \*▲ 1485 Locknut (2 Req'd)

○● \*▲ 283949 Lockscrew (2 Req'd)

○● □▲ 64520 Washer (As req'd)

○● □▲ 326317 Washer (As req'd)

\* NOTE: Coat 292230 ADJ. screw, 283949 lockscrew and 1485 locknut with oil prior to assembly.

□ NOTE: These parts used at final test to obtain correct pressure range.

# WARNING

Use only a DG4V3(S)-OA-60 or DG4V3(S)-OAL-60 directional valve as a pilot for this relief valve. Use of a different pilot can block relief valve, causing excessive system pressure.

○●△▲ 263497 "O"Ring (2 Req'd)

○●▲ 329463 Plug (3 Req'd)  
Torque 52.8-58.3 N.m.  
(39-43 lb. ft.)

○ 294656 Restrictor plug (2 Req'd) C\*-10 only

○● 285601 Seat (2 Req'd)  
Assemble cross hole facing up

▲ 226816 Rollpin

Lockwasher (see table)

Screw (see table)

▲ 113000 Plug  
● (C\*-06 5 Req'd)  
○ (C\*-10 7 Req'd)

○● 370839 Warning plate

○●▲ 227405 Screw (4 Req'd)

Hi-Vent spring (C\*-10) See table

Lo-Vent spring (C\*-06/10) See table

Hi-Vent spring (C\*-06 only) See table

Hydrocone (see table)

Seat (see table)

△▲ 262361 "O"Ring (C\*-06)  
262367 "O"Ring (C\*-10)

# NOTE:

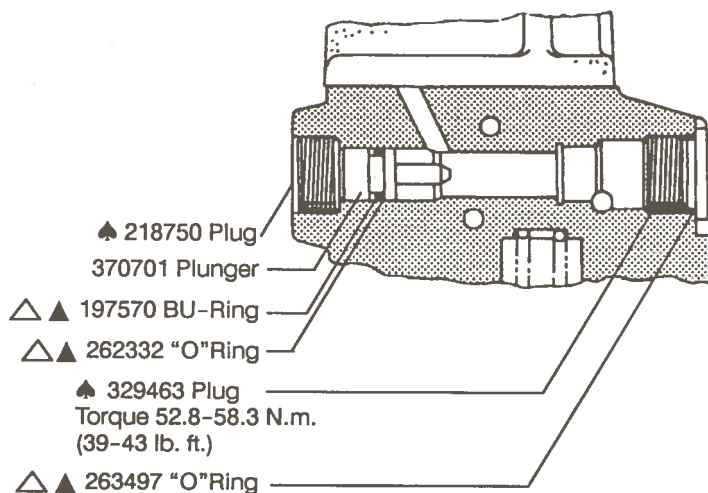
For satisfactory service life of these components in industrial applications, use full flow filtration to provide fluid which meets ISO cleanliness code 18/15 or cleaner. OFP, OFR, and OFRS series filters are recommended.

Model	Seat	Hydrocone	Lo-Vent spring	Hi-Vent spring	Cover
C*-06	343153	343154	2077	184458	● 370666
C*-10	283954	283952	291822	291821	○ 370671

NOTE: Use either a Lo-Vent or Hi-Vent spring. Do not use both.  
(See model code)

Model	Screw (4 Req'd)	Torque		Lock washer (4 Req'd)
		lb. ft.	N.m	
C*-06	1036	11-15	14.9-20.3	68907
C*-10	1076	35-43	47.5-58.3	68909

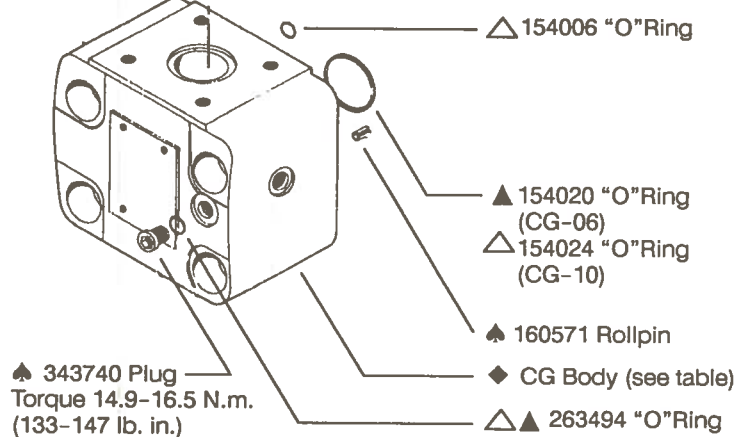
Sectional "E" vent head 1 or 3



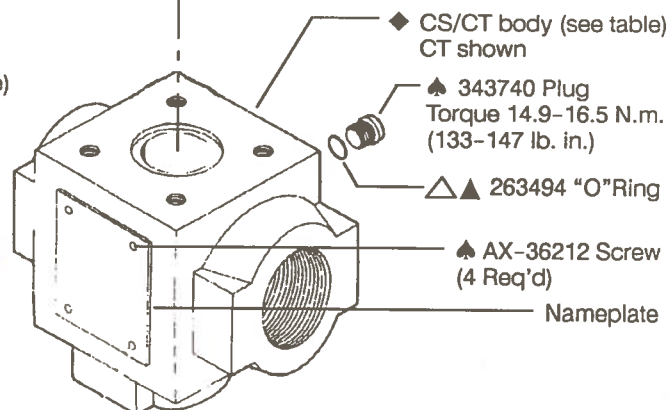
Model	Cover spring	Pressure range psi (bar)
C*-**-B	2280	125-1000 (8.5-70)
C*-**-C	583937	500-2000 (35-140)
C*-**-F	2281	1500-3000 (105-210)

♠ Part	Kit
1485	944064
AX-36212	944053
64520	944068
113000	944055
160571	944069
218750	944070
226816	944071
227405	944074
292230	944072
326317	944073
329463	944041
343740	944038

Parts with ♠ available only in kits of 25.  
Reference kit on parts order.



Model	◆ Body	
	-06	-10
CG	580456	581703
CS	581701	580430
CT	590348	590300



- ▲ Included in -06 F3 seal kit 919684
- ▲ Included in -10 F3 seal kit 919685
- Included in CT-06-BC cover kit 942155
- Included in CT-10-BC cover kit 942156
- ♠ Available only in kits of 25.
- ◆ Not available for sale

# Model Code

(F3)	-	C*	**	-	**	(*)	(V)	-	DG	-	**	(L)	**	-	(V)	M	-	(S*)	-	*	-	**	-	*	-	*	-	*	(L)	-	**	*	-	***	-	**	-	EN**

**1** Seals for mineral oil & fire resistant fluids

**2** Relief valve connections

G - Subplate mounting  
S - Straight threads  
T - NPTF threads

**3** Valve size

06 - 3/4"  
10 - 1-1/4"

**4** Pressure range

B - 125-1000 psi  
C - 500-2000 psi  
F - 1500-3000 psi  
E - Vent

**5** High vent

Blank - Omit for low vent models

**6** Directional valve

**7** Spool type & spring arrangement

0A(L) - Spring offset

**8** Left hand build

Omit for standard models

**9** Manual override options (included in pilot valve model code)

Blank - Plain override solenoid ends only  
H - Waterproof override solenoid ends only  
H2 - Waterproof override both ends of single solenoid  
M - Serviceable manual overrides in solenoid ends only  
P2 - Plain override both ends of single solenoid  
Y - Lockable manual overrides solenoid ends only  
Z - No overrides in either end

**10** Solenoid energization identity

Blank - Standard arrangement for ANSI B93.9 (energise solenoid A for flow P to A port)

V - Solenoid identification determined by position of solenoid. (Solenoid A at port A end and/or solenoid B at port B end. (All 4 & 8 spools are always V code)

**11** Flag symbol heading electrical options & features

**12** Spool position monitoring switch (tank pressure rating 10 bar only)

S1 - Switch, normally open, U coils only  
S2 - Switch, normally closed, U coils only  
S3 - Switch, wired normally open, P\*  
S4 - Switch, wired normally closed, P\*  
S5 - Switch, free leads, FW & FJ only  
Omit if not required

**13** Coil type

U - ISO 4400  
P - Plug in coil  
F - Flying lead  
SP1 - Single 6,3 series spade to IEC 760  
SP2 - Dual 6,3 series spade to IEC 760

**14** Electrical connections (F type coil only) omit if not required

T - Wired terminal block  
PA - Instaplug male receptacle only  
PB - Instaplug male & female receptacle  
PA3 - Three pin connector & terminal block  
PA5 - Five pin connector & terminal block

**15** Housing (F type coils only)

W - 1/2 NPT thread wiring housing  
J - 20 mm thread wiring housing

**16** Electrical options

1 - ISO with fitted plug, U type coils only  
7 - Surge damper, P type coils only  
9 - Rectifier (fast type) P type coils only  
12 - Rectifier (slow type) P type coils only

**17** Solenoid Indicator lights (F build only) To be used with T terminal block models. (Omit if not required)

**18** Coil identification

**19** Pilot valve code (tank pressure rating)

2 - 10 bar (145 psi) use with switch models S\*  
5 - 100 bar (1450 psi) for all other models

**20** Pilot valve port orifices

**21** Design

40 - DG4V3S-60  
Standard pilot valve  
50 - DG4V3-60  
High performance pilot valve

**22** Special modifications (omit if not required)

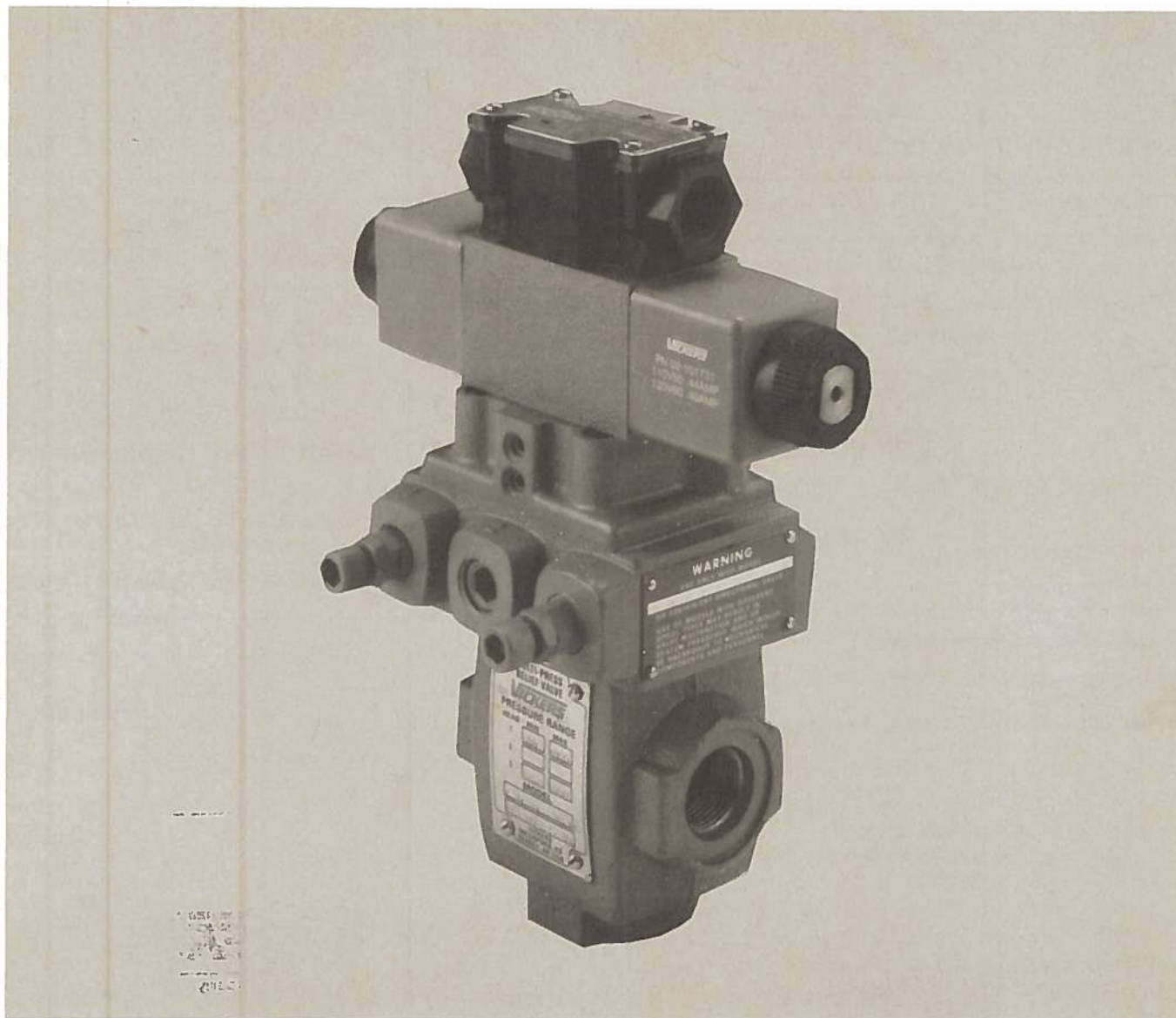
**7** Thru **20** Included in pilot valve model code

**VICKERS®**  
A TRIHIOVA COMPANY



## Multi-Pressure Relief Valves

(F3)-C/G/S/T-06/10\*\*(\*)-(V)-DG-8C(L)\*\*-(V)M-(S\*)\*\*\*\*\*-(L)\*\*\*\*\*-40/50



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.



NOTE: Lubricate all parts & seals with a thin coat of oil at assembly.

DG4V3(S)-8C(L)-60 Pilot valve (Refer to parts drawing for detailed information).

255698 Bolt kit (Torque 4.5-5.6 N.m.)  
40-50 lb.in. (Pilot valve to adapter plate mounting) Not shown

255651 Bolt kit (Torque 14.9-20.3 N.m.)  
11-15 lb.ft. (Adapter plate to cover mounting)

422814 Adapter plate

113000 Plug (4 Req'd)

262334 "O"Ring (4 Req'd)

1649 Ball (2 Req'd) (C\*-06 only)

Cover (see table)

290057 Piston (3 Req'd)

Cover spring (see table)

262332 "O"Ring (3 Req'd)

197570 BU-Ring (3 Req'd)

370701 Plunger (3 Req'd)

\* 292230 ADJ. screw (3 Req'd)

\* 1485 Locknut (3 Req'd)

\* 283949 Lockscrew (3 Req'd)

64520 Washer (As req'd)

326317 Washer (As req'd)

\* NOTE: Coat 292230 ADJ. screw, 283949 lockscrew and 1485 locknut with oil prior to assembly.

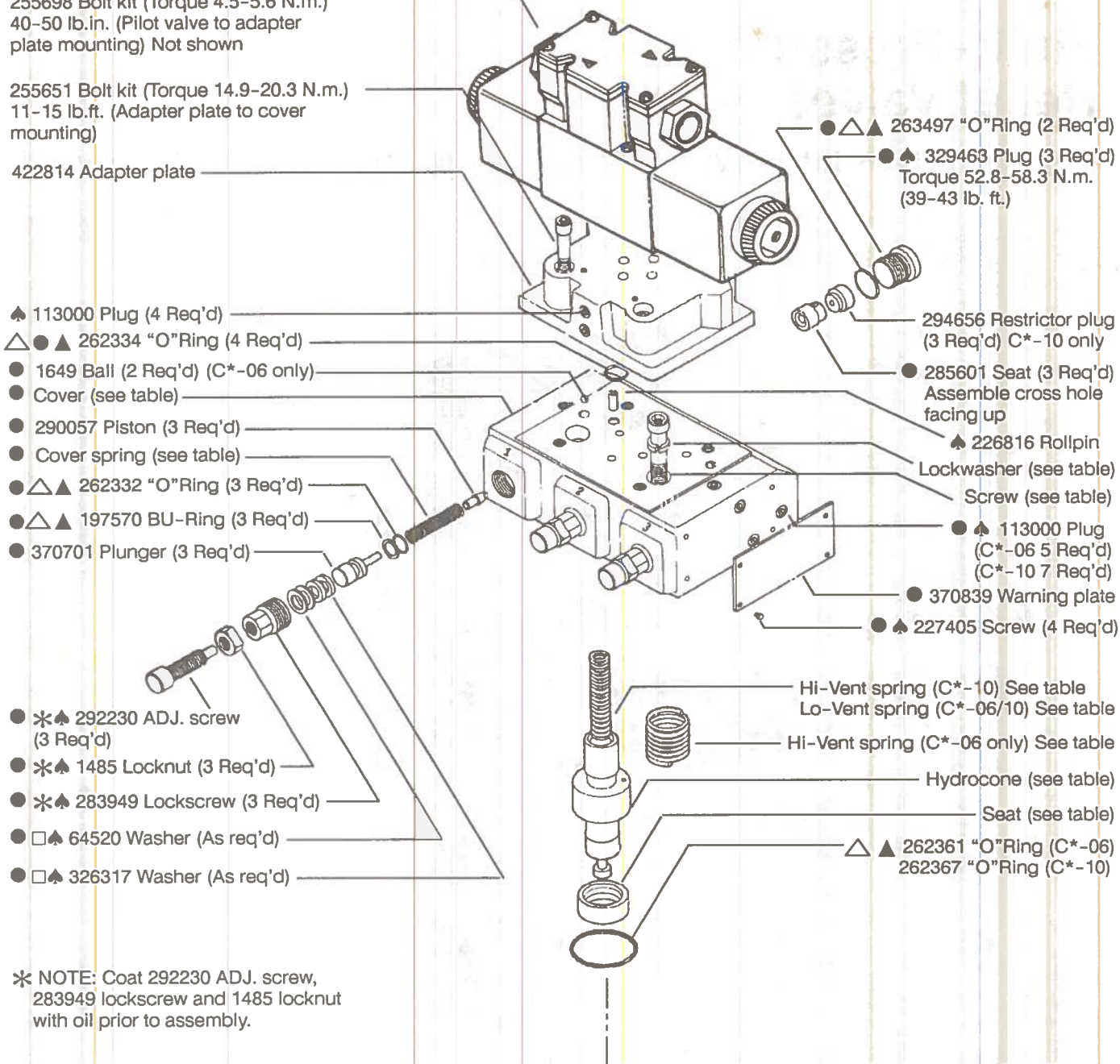
NOTE: These parts used at final test to obtain correct pressure range.

Model	Seat	Hydrocone	Lo-Vent spring	Hi-Vent spring	Cover
C*-06	343153	343154	2077	184458	370664
C*-10	283954	283952	291822	291821	370669

NOTE: Use either a Lo-Vent or Hi-Vent spring. Do not use both. (See model code)

## WARNING

Use only a DG4V3(S)-8C-60 directional valve as a pilot for this relief valve. Use of a different pilot can block relief valve, causing excessive system pressure.



## NOTE:

For satisfactory service life of these components in industrial applications, use full flow filtration to provide fluid which meets ISO cleanliness code 18/15 or cleaner. OFP, OFR, and OFRS series filters are recommended.

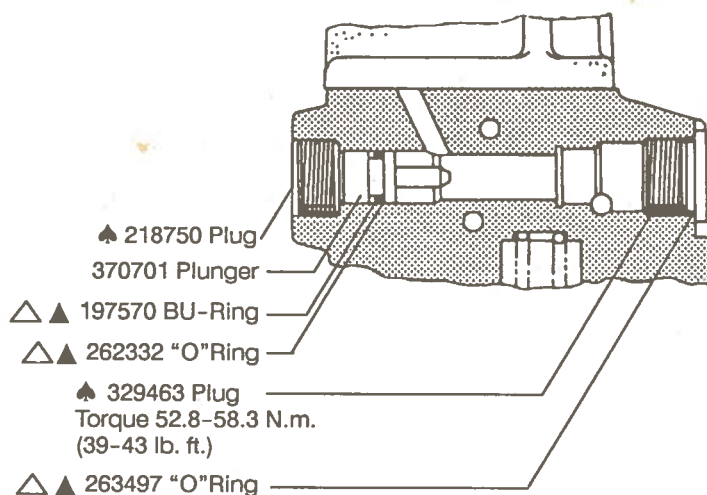
Model	Screw (4 Req'd)	Torque		Lock washer (4 Req'd)
		lb. ft.	N.m.	
C*-06	1036	11-15	14.9-20.3	68907
C*-10	1076	35-43	47.5-58.3	68909

Cover kits for C\*-06-\*\*\* are available for several spring arrangements

Spring order in head 1 2 3	● Included in kit (-06 only)
-C B F-	● 942198
-C B C-	● 942202
-F F B-	● 942326

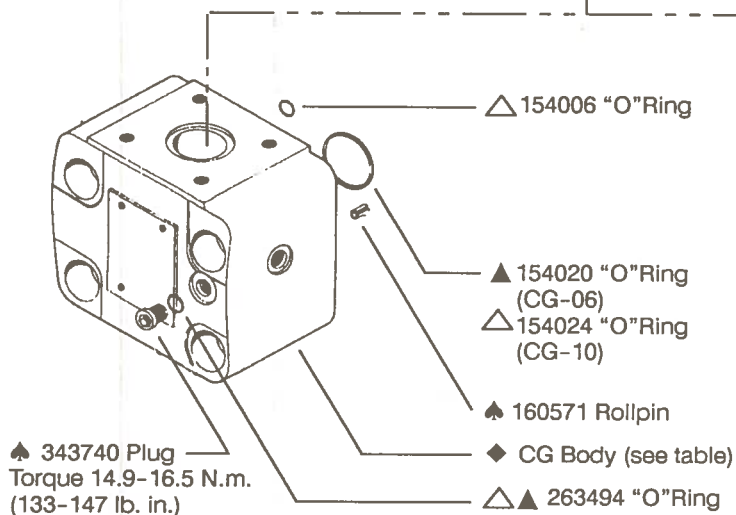
Model	Cover spring	Pressure range psi (bar)
C*-***-B	2280	125-1000 (8.5-70)
C*-***-C	583937	500-2000 (35-140)
C*-***-F	2281	1500-3000 (105-210)

Sectional "E" vent head 1, 2, or 3



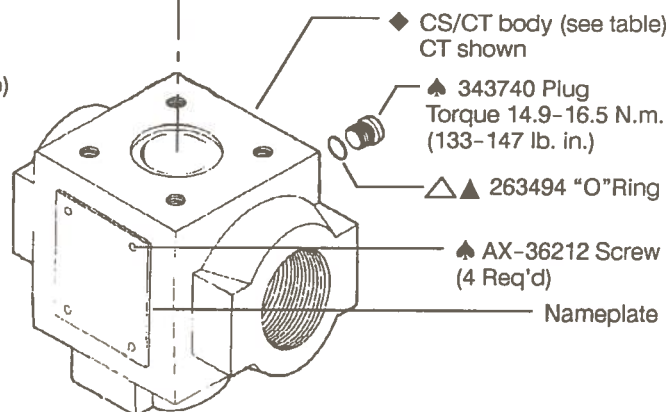
♠ Part	Kit
1485	944064
AX-36212	944053
1649	944067
64520	944068
113000	944055
160571	944069
218750	944070
226816	944071
227405	944074
292230	944072
326317	944073
329463	944041
343740	944038

Parts with ♠ available only in kits of 25.  
Reference kit on parts order.



- ▲ Included in -06 F3 seal kit 919684
- ▲ Included in -10 F3 seal kit 919685
- ♠ Available only in kits of 25.
- ◆ Not available for sale

Model	◆ Body	
	-06	-10
CG	580456	581703
CS	581701	580430
CT	590348	590300



# Model Code

(F3)	-C*	**	-**(*)	(V)	-DG-	**	(L)	**	-(V)	M-	(S*)	-*	**	-*	**	(L)	-**	*	-***	-**	-EN**
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

**1** Seals for mineral oil & fire resistant fluids

**2** Relief valve connections

G - Subplate mounting  
S - Straight threads  
T - NPTF threads

**3** Valve size

06 - 3/4"  
10 - 1-1/4"

**4** Pressure range

B - 125-1000 psi  
C - 500-2000 psi  
F - 1500-3000 psi  
E - Vent

**5** High vent

Blank - Omit for low vent models

**6** Directional valve

**7** Spool type & spring arrangement

8C - Spring centered, Tri-pressure

**8** Left hand build

Omit for standard models

**9** Manual override options (included in pilot valve model code)

Blank - Plain override solenoid ends only  
H - Waterproof override solenoid ends only  
H2 - Waterproof override both ends of single solenoid  
M - Serviceable manual overrides in solenoid ends only  
P2 - Plain override both ends of single solenoid  
Y - Lockable manual overrides solenoid ends only  
Z - No overrides in either end

**10** Solenoid energization identity

Blank - Standard arrangement for ANSI B93.9 (energise solenoid A for flow P to A port)

V - Solenoid identification determined by position of solenoid. (Solenoid A at port A end and/or solenoid B at port B end. (All 4 & 8 spools are always V code)

**11** Flag symbol heading electrical options & features

**12** Spool position monitoring switch (tank pressure rating 10 bar only)

S1 - Switch, normally open, U coils only  
S2 - Switch, normally closed, U coils only  
S3 - Switch, wired normally open, P\*  
S4 - Switch, wired normally closed, P\*  
S5 - Switch, free leads, FW & FJ only  
Omit if not required

**13** Coil type

U - ISO 4400  
P - Plug in coil  
F - Flying lead  
SP1 - Single 6,3 series spade to IEC 760  
SP2 - Dual 6,3 series spade to IEC 760

**14** Electrical connections (F type coil only) omit if not required

T - Wired terminal block  
PA - Instaplug male receptacle only  
PB - Instaplug male & female receptacle  
PA3 - Three pin connector & terminal block  
PA5 - Five pin connector & terminal block

**15** Housing (F type coils only)

W - 1/2 NPT thread wiring housing  
J - 20 mm thread wiring housing

**16** Electrical options

1 - ISO with fitted plug, U type coils only  
7 - Surge damper, P type coils only  
9 - Rectifier (fast type) P type coils only  
12 - Rectifier (slow type) P type coils only

**17** Solenoid indicator lights (F build only) To be used with T terminal block models. (Omit if not required)

**18** Coil identification

**19** Pilot valve code (tank pressure rating)

2 - 10 bar (145 psi) use with switch models S\*  
5 - 100 bar (1450 psi) for all other models

**20** Pilot valve port orifices

**21** Design

40 - DG4V3S-60  
Standard pilot valve  
50 - DG4V3-60  
High performance pilot valve

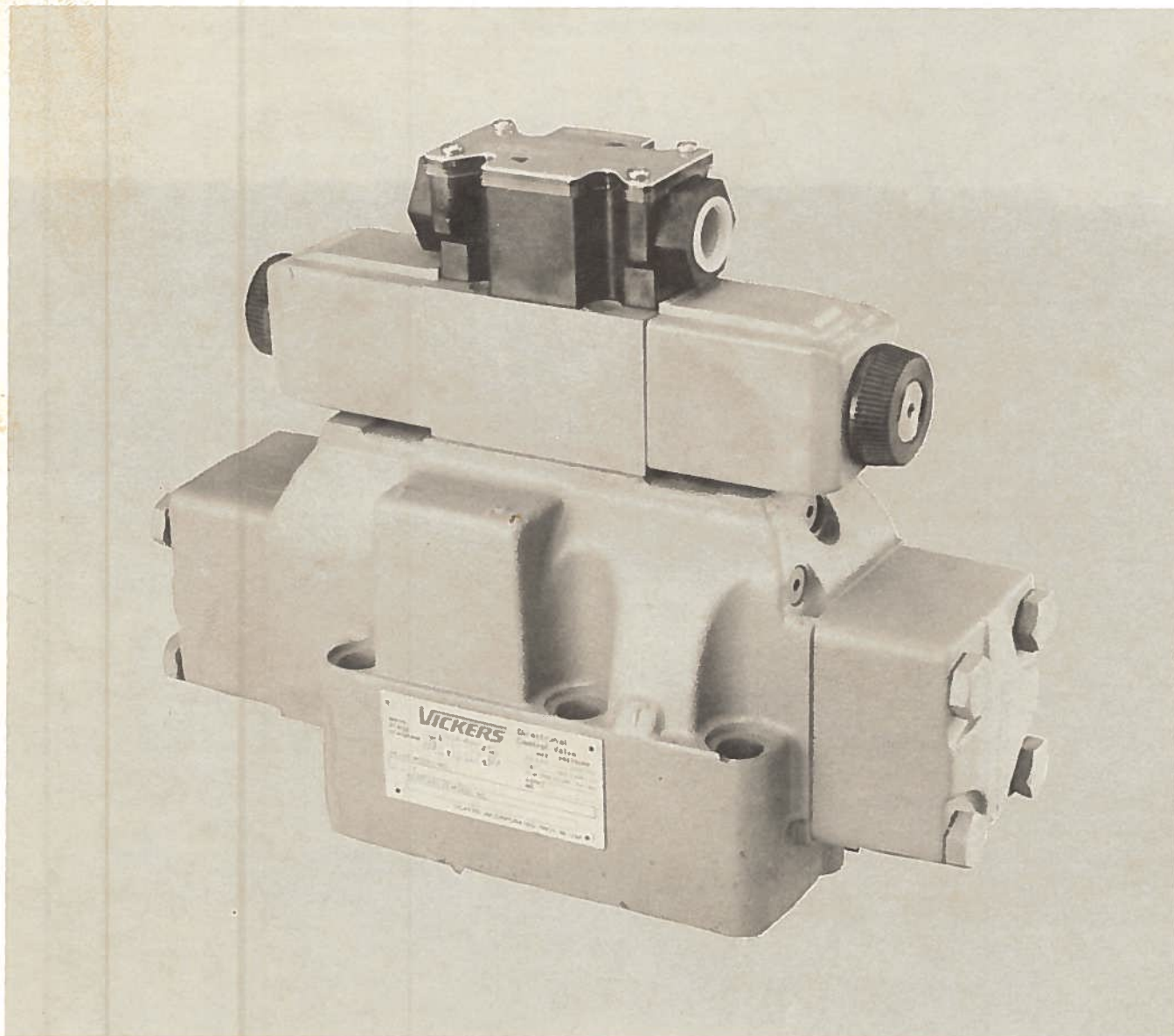
**22** Special modifications (omit if not required)

**7** Thru **20** Included in pilot valve model code



# Solenoid Controlled Pilot Operated Directional Valve

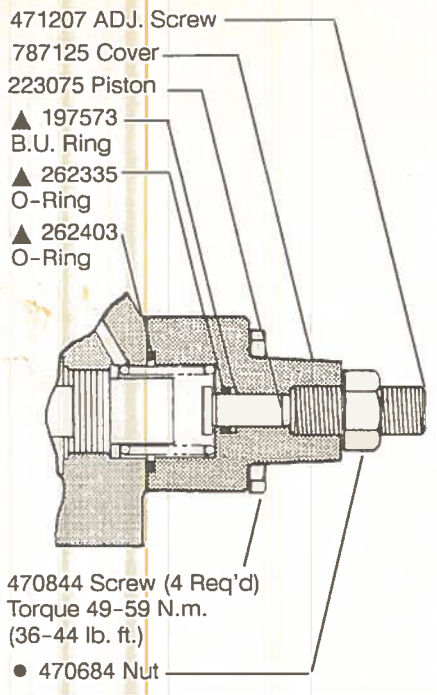
DG5S-H8-\*\*(L)-(X)-(E)-(T)(\*)-(V)M-(S\*)-\*(\*\*)\*\*(L)-\*\*\*-\*\*\*-60/70



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.



Parts shown included in stroke ADJ. kit 941156. Order two kits if stroke ADJ. is required both ends.



■ PLUG	TORQUES (OILED)	
	N.m.	lb. in.
113000	5.0-5.9	45-52
237588		
343740	15.0-16.0	133-142
398071	9.8-10.2	87-90
407533	12.1-12.4	107-110

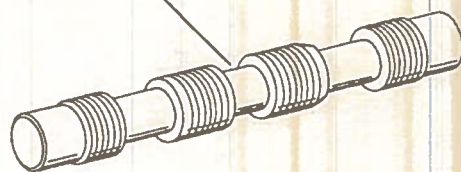
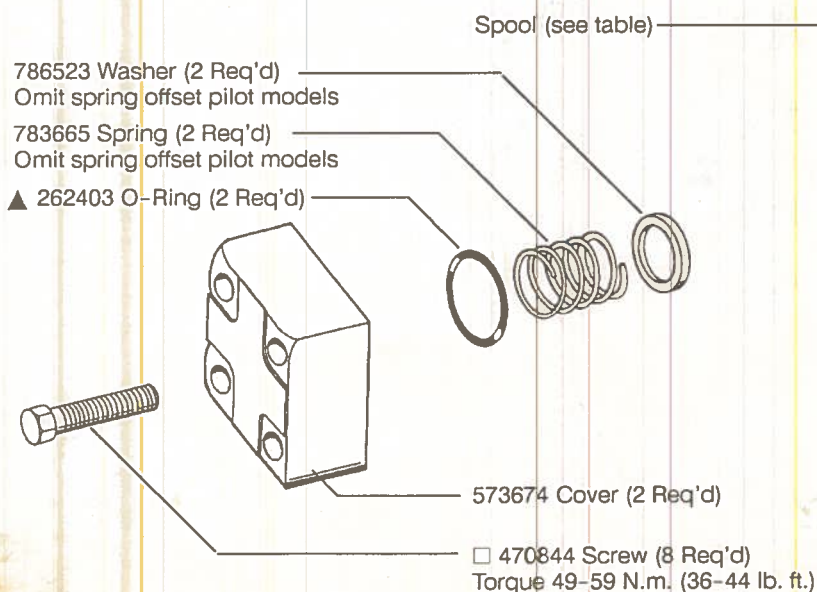
MAIN STAGE SPOOL TYPE	AVAILABLE VALVE TYPE	SPOOL	MAIN STAGE ID PLATE	
			"A" ONLY	B/C/F/N
0	A/B/C//N	786350	400975	400976
1		*786557		400977
2		786349		400978
3		*786558		400979
4		628162		400980
6		786559		400981
8		627221		400980
9		786561		400976
11		*786557		632700
31		*786558		580475
33		786562		400981

**\* SPOOL ASSEMBLY NOTE**

Assemble type 1 & 3 spools with narrow center land toward "A" end of valve. "A" end is defined as being closest to CYL. port "A". Type 11 & 31 spools are installed in reverse of type 1 & 3 with narrow center lands toward "B" end of valve.

VALVE MODEL CODE	MAIN STAGE SPOOL TYPE	PILOT VALVE MODEL CODE
DG5S-H8-*A-60	0, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3S-2A-60
DG5S-H8-*A-70		DG4V-3-2A-60
DG5S-H8-*A-60	4 & 8	DG4V-3S-28A-60
DG5S-H8-*A-70		DG4V-3-28A-60
DG5S-H8-*B-60	0, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3S-6B-60
DG5S-H8-*B-70		DG4V-3-6B-60
DG5S-H8-*B-60	4 & 8	DG4V-3S-68B-60
DG5S-H8-*B-70		DG4V-3-68B-60
DG5S-H8-*C-60	0, 1, 2, 3, 6, 9, 11, 31, 33, 52, 521	DG4V-3S-6C-60
DG5S-H8-*C-70		DG4V-3-6C-60
DG5S-H8-*C-60	4 & 8	DG4V-3S-68C-60
DG5S-H8-*C-70		DG4V-3-68C-60
DG5S-H8-*N-60	0, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3S-6N-60
DG5S-H8-*N-70		DG4V-3-6N-60
DG5S-H8-*N-60	4 & 8	DG4V-3S-68N-60
DG5S-H8-*N-70		DG4V-3-68N-60

See pilot valve service drawing for parts breakdown



- ▲ Included In F3 Seal Kit 696895
- ★ Included In Plug Kit 941167
- Included In Fastener Kit 941175
- ◆ Not Available For Sale
- ♠ Used On Check Valve Models Only
- Plug Torques (See Table)
- Available Only In Kit Of 25 Each

**PILOT STAGE BOLT KIT (INCLUDES 4 ATTACHING BOLTS)**

MODEL	BOLT KIT
W/O Pilot choke	696892
W/ Pilot choke	696893

Torque 4.5-5.7 N. m. (39.8-50.4 lb. in.)  
See pilot choke service drawing for parts breakdown

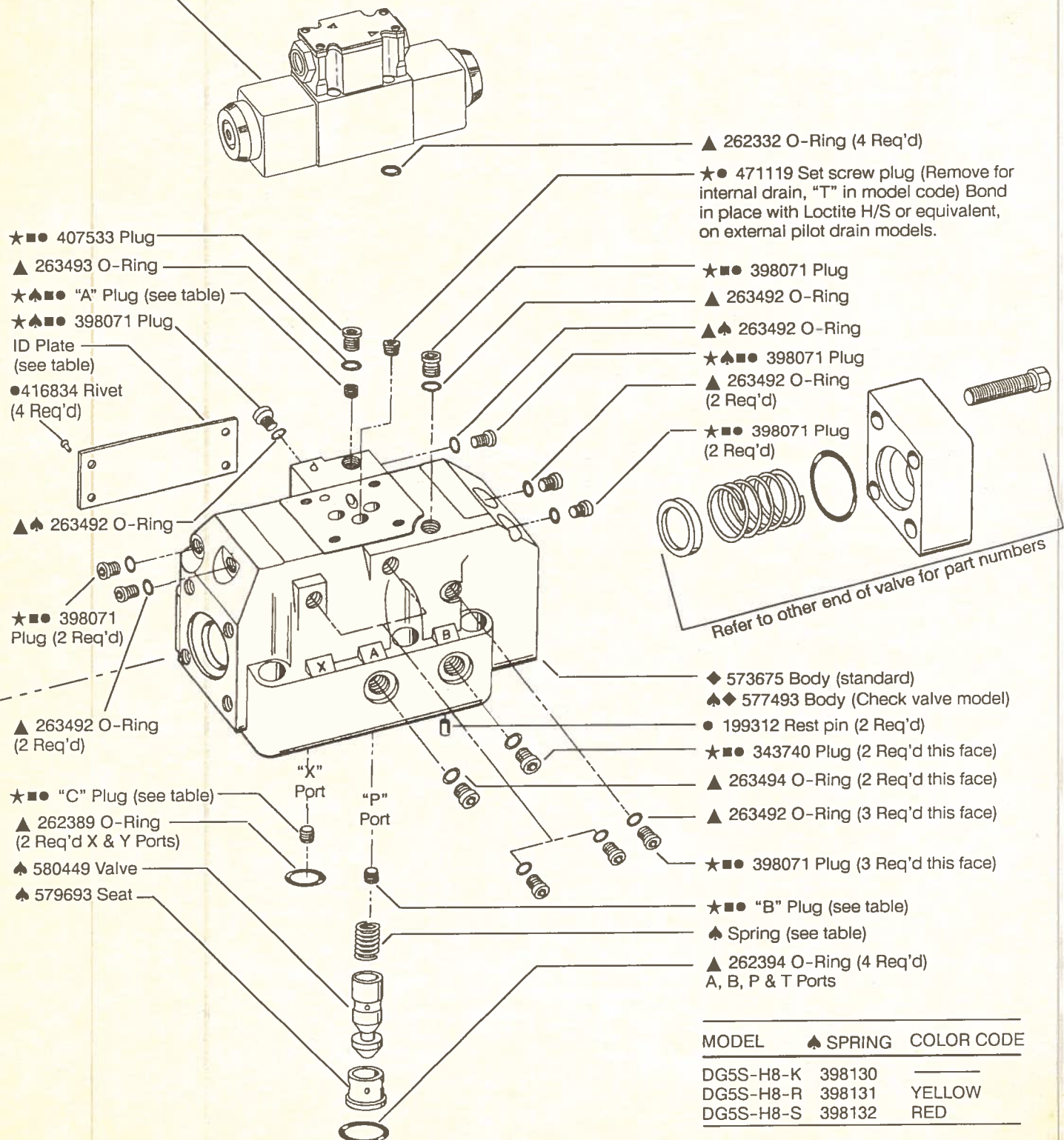
This solenoid removed on right hand A & B models. Refer to service drawings for more detailed information on left hand valves.

**■ PLUG INSTALLATION TABLE**

MODEL	"A" PLUG	"B" PLUG	"C" PLUG
DG5S-H8-**-**	DOES NOT EXIST	237588	—
DG5S-H8-**-E		113000	237588
DG5S-H8-**-X		—	—
DG5S-H8-**-X-E	—	113000	—
DG5S-H8-**-KRS	237588	DOES NOT EXIST	—
DG5S-H8-**-E-KRS	113000		237588
DG5S-H8-**-X-KRS	—		—
DG5S-H8-**-X-E-KRS	113000	—	—

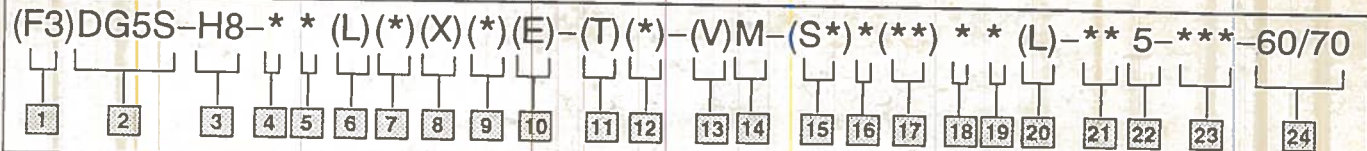
★ 113000 Solid plug

★ 237588 Orifice plug





# Model Code



**1** Seals for mineral oil & fire resistant fluids

**2** Directional control valve  
Manifold or subplate mounted  
Solenoid controlled  
Pilot operated  
Rated pressure 310 Bar (4500 psi)

**3** High flow interface  
8 - NFPA-D06 (ISO-4401-08)

**4** Spool type (see table)

**5** Spool/Spring arrangement  
A - Spring offset, to CYL. A  
B - Spring centered, sol. A removed  
C - Spring centered  
F - Spring offset, to CYL. A shift to center  
N - No spring detented

**6** Left hand  
L - Left hand (single solenoid only)  
Blank - Omit when not required

**7** Manual override option  
Blank - Plain override solenoid ends only  
H - Waterproof override solenoid ends only  
H2 - Waterproof override both ends of single solenoid  
P2 - Plain override both ends of single solenoid  
Y - Lockable manual overrides solenoid ends only/DC only  
Z - No overrides in either end

**8** Response type  
X - Fast response  
Blank - Standard low shock models

**9** Spool control modifications

1 - Stroke adjustment  
2 - Pilot choke adjustment  
3 - Pilot choke & stroke adjustment  
7 - Stroke adjustment CYL. A only  
8 - Stroke adjustment CYL. B only  
2-7 - Dual pilot choke & stroke ADJ. A port end only  
2-8 - Dual pilot choke & stroke ADJ. B port end only  
Blank - Omit when not required

**10** Pilot pressure  
E - External pilot pressure  
Omit - Internal pilot pressure

**11** Pilot drain  
T - Internal pilot Drain  
Omit - External pilot drain

**12** Pressure port check valve  
K - 0.35 bar (5 psi cracking pressure)  
R - 3.45 bar (50 psi cracking pressure)  
S - 5.20 bar (75 psi cracking pressure)  
Blank - Omit when not required

**13** Solenoid energization identity  
Blank - Standard arrangement for ANSI B93.9 (energise solenoid A for flow P to A port)  
V - Solenoid identification determined by position of solenoid. (Solenoid A at port A end and/or solenoid B at port B end. (All 4 & 8 spools are always V code)

**14** Flag symbol heading electrical options & features

**15** Spool indicator switch  
Available on high performance models, DG4V-3, only.  
Omit when not required.

S1 - Options available on U only)  
S2 - Options available on U only)  
S3 - Options available on P\* only  
S4 - Options available on P\* only  
S5 - Options available on FW/FJ only

**16** Coil type

U - ISO 4400  
F - Flying lead  
SP1 - Single 6,3 MM spade, to IEC 760  
SP2 - Dual 6,3 MM spade to IEC 760

**17** Electrical connections (F type coil only) omit if not required  
T - Wired terminal block  
PA - Instaplug male receptacle only  
PB - Instaplug male & female receptacle  
PA3 - Three pin connector  
PA5 - Five pin connector

**18** Housing (F type coils only)

W - 1/2 NPT thread wiring housing  
J - 20 mm thread wiring housing

**19** Electrical options

1 - ISO with fitted plug, U type coils only  
6 - ISO with fitted plug, & lights  
U type coils only

**20** Solenoid indicator lights (F build only) used with T terminal block models. (Omit if not required)

**21** Coil identification

**22** Pilot valve code (tank pressure rating)

2 - 10 bar (145 psi) DG4V3-60  
5 - 100 bar (1450 psi) DG4V3S-60  
6 - 160 bar (2285 psi) DG4V3-60  
7 - 210 bar (3000 psi) DG4V3-60

**23** Pilot valve port orifices

**24** Design

60 - DG4V3S-60 pilot valve  
70 - DG4V3-60 pilot valve

**6** Thru **23** included in pilot valve model code

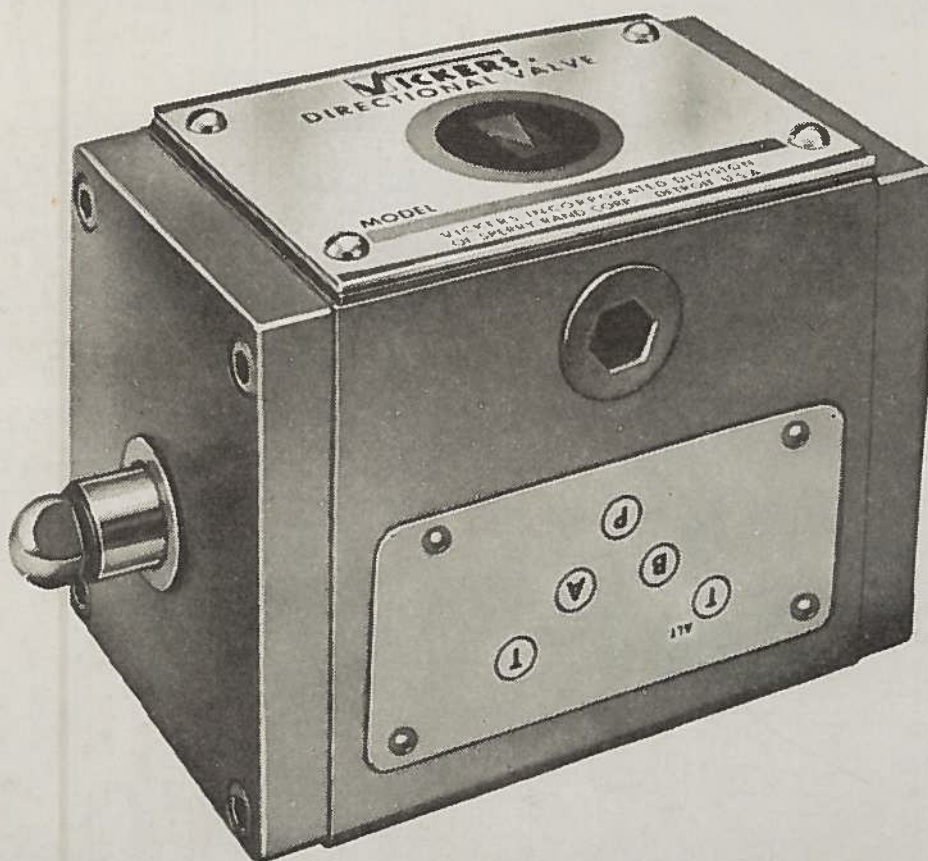


# Service Parts Information

Directional &  
Deceleration  
Valves

DG1(7)S\*-01\*(\*)-50  
DG2S\*-012A-50  
DG16S2-010A-50

5



Vickers, Incorporated

P.O. Box 302  
Troy, Michigan 48007-0302

Revised 11-1-85 I-3546-S



# DIRECTIONAL VALVES

DG1(7)S\*-012A-50

DG2S\*-012A-50

# DECELERATION VALVE

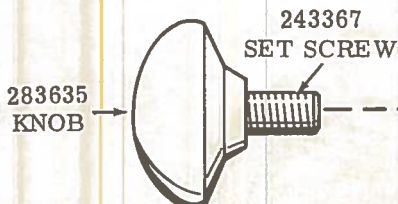
DG16S2-010A-50

MODEL	SCREW
DG1S*-	185645 (4 REQ'D)
DG2S*-	
DG16S2-	
DG17S*-	185645 (2 REQ'D)

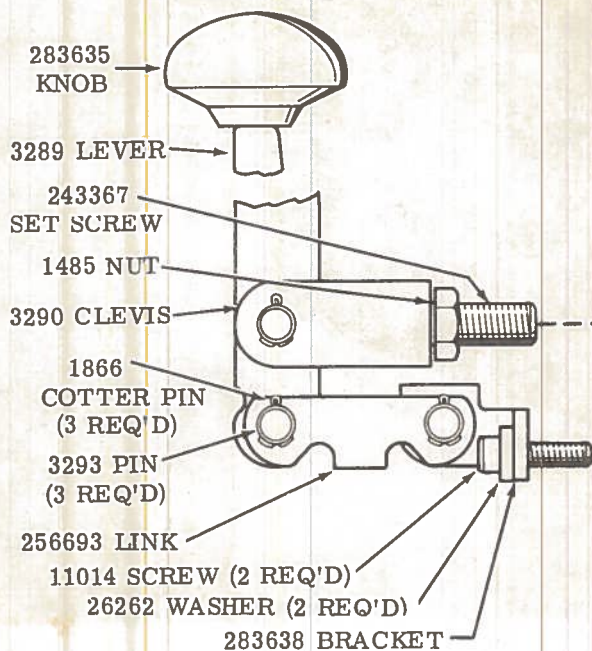
DG2S\*- AND DG16S2- MODELS



DG1S\* MODELS



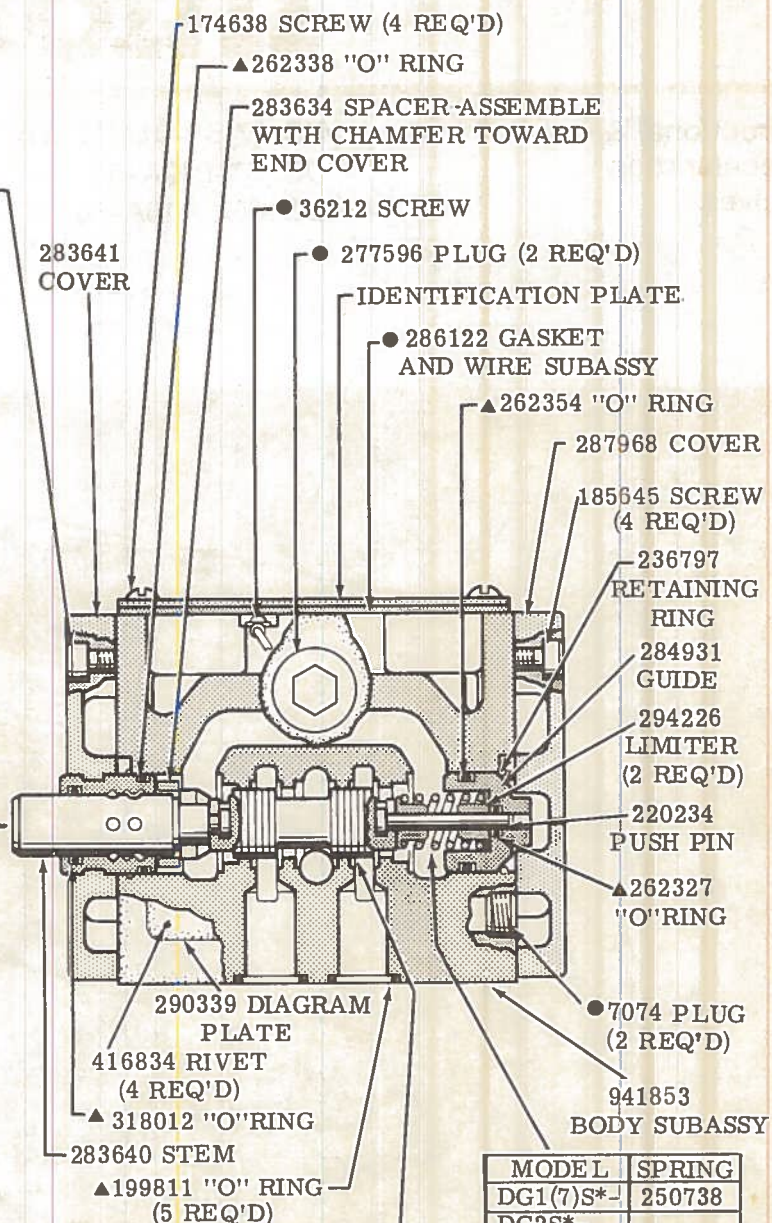
DG17S\*- MODELS



▲ INCLUDED IN  
SEAL KIT 919423

EQUIVALENT F3  
SEAL KIT 919432

● INCLUDED IN  
941853 BODY SUBASSY



MODEL	SPOOL
DG1S2-012A-50	289186
DG1S4-012A-50	213231
DG2S2-012A-50	289186
DG2S4-012A-50	213231
DG16S2-010A-50	289187
DG17S2-012A-50	289186
DG17S4-012A-50	213231

MODEL	SPRING
DG1(7)S*-	250738
DG2S*-	248596
DG16S2-	

INSTALL 289187  
SPOOL THIS WAY



TOWARD OPER-  
ATING STEM



**DIRECTIONAL VALVES**  
**DG1(7)S\*-01\*(C)-50**  
**DG1(7)S\*-01\*N-50**

\*ASSEMBLE ON SPOOL WITH SHARP  
 BREAK EDGE OF WASHER TOWARD  
 THE SPRING.

SPACER	MODEL	WASHER	SPRING	SPACER	SPACER	WASHER	SPACER
283634	DG1(7)S2-012-50	—	—	—	298110	283632	—
—	DG1S4-018C-50	*283637	290072	—	349821	283632	283631
—	DG1S4-01*C-50	283632	290072	283639	283639	283632	283639
—	DG17S4-018C-50	*283637	312100	—	349821	283632	283631
—	DG17S4-01*C-50	283632	312100	283639	283639	283632	283639
—	DG1(7)S4-018N-50	—	—	—	349821	283632	—
283634	DG1(7)S4-01*N-50	—	—	—	298110	283632	—

ASSEMBLE WITH  
 CHAMFER TOWARD  
 END COVER.

MODEL	SCREW
DG1S*-	185645(4 REQ'D)
DG17S*-	185645(2 REQ'D)

DG1S\*- MODELS



283635 KNOB

243367  
 SET SCREW

● 277596 PLUG (2 REQ'D)  
 ● 36212 SCREW-  
 IDENTIFICATION  
 PLATE  
 ● 286122 GASKET  
 AND WIRE S/A

● 277596 PLUG (2 REQ'D)  
 ● 36212 SCREW-  
 IDENTIFICATION  
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 ● 36212 SCREW-  
 IDENTIFICATION  
 PLATE  
 ● 286122 GASKET  
 AND WIRE S/A

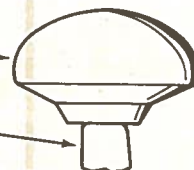
● 277596 PLUG (2 REQ'D)  
 ● 36212 SCREW-  
 IDENTIFICATION  
 PLATE  
 ● 286122 GASKET  
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● 277596 PLUG (2 REQ'D)  
 ● 36212 SCREW-  
 IDENTIFICATION  
 PLATE  
 ● 286122 GASKET  
 AND WIRE S/A

DG17S\*- MODELS



283635 KNOB

3289 LEVER

243367 SET SCREW

1485 NUT

3290 CLEVIS

1866 COTTER PIN  
 (3 REQ'D)

3293 PIN (3 REQ'D)

256693 LINK

11014 SCREW (2 REQ'D)

26262 WASHER (2 REQ'D)

283638 BRACKET

▲ INCLUDED IN  
 SEAL KIT 919423

EQUIVALENT F3  
 SEAL KIT 919432

● INCLUDED IN  
 941853 BODY SUBASSY

MODEL	SPRING	BALL (2 REQ'D)
DG1(7)S4-01*N-50	256725	242746

NOTE: DETENT PARTS SHOWN IN  
 POSITION FOR TYPE 8 SPOOL.  
 ASSEMBLE IN HOLE CLOSER TO END  
 COVER FOR ALL OTHER SPOOLS.

174638  
 SCREW  
 (4 REQ'D)

185645 SCREW  
 (4 REQ'D)

▲ 318012  
 "O" RING  
 (2 REQ'D)

289185 STEM

● 7074 PLUG  
 (2 REQ'D)

283641  
 COVER  
 (2 REQ'D)

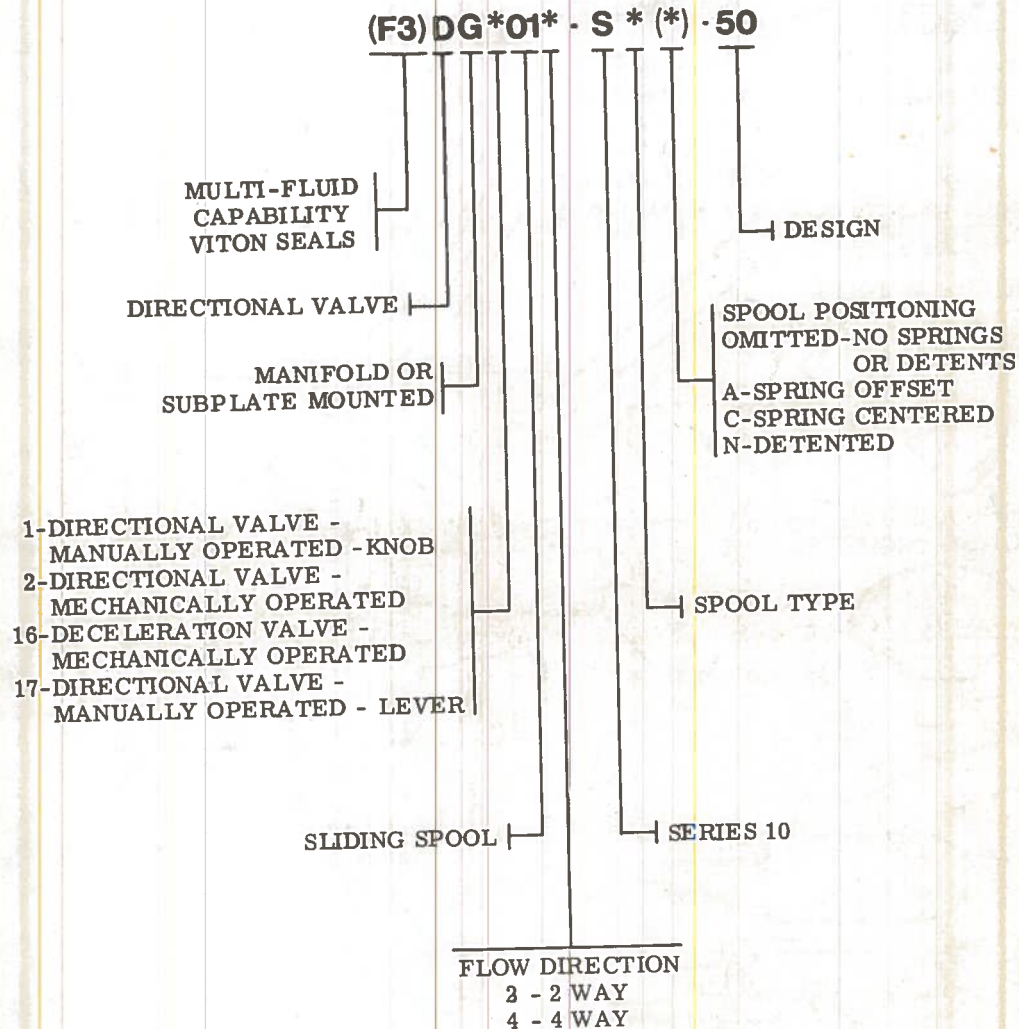
941853  
 BODY  
 SUBASSY

290339  
 DIAGRAM  
 PLATE  
 416834 RIVET  
 (4 REQ'D)

▲ 199811  
 "O" RING  
 (5 REQ'D)

MODEL	SPOOL
DG1(7)S2-012-50	289186
DG1(7)S4-010*-50	213230
DG1(7)S4-011*-50	276278
DG1(7)S4-012*-50	213231
DG1(7)S4-013*-50	239903
DG1(7)S4-016*-50	213232
DG1(7)S4-017*-50	236624
DG1(7)S4-018*-50	235637
DG1(7)S4-0133*-50	236615

## MODEL CODE BREAKDOWN



**WARNING: USE THIS DRAWING FOR PARTS INFORMATION ONLY.**

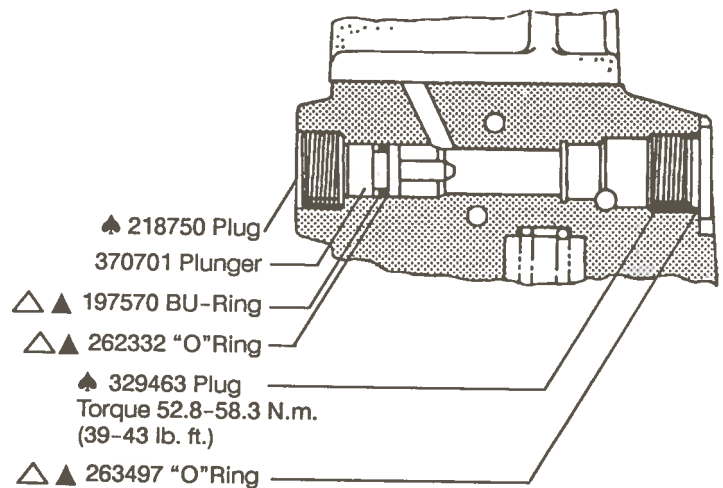
For satisfactory service life of these components, use full flow filtration to provide fluid which meets ISO cleanliness code 18/15 or cleaner. Selections from Vickers OFFP, OFR, and OFRS series are recommended.

Litho in U. S. A.



Model	Screw (4 Req'd)	Torque		Lock washer (4 Req'd)
		lb. ft.	N.m	
C*-06	1036	11-15	14.9-20.3	68907
C*-10	1076	35-43	47.5-58.3	68909

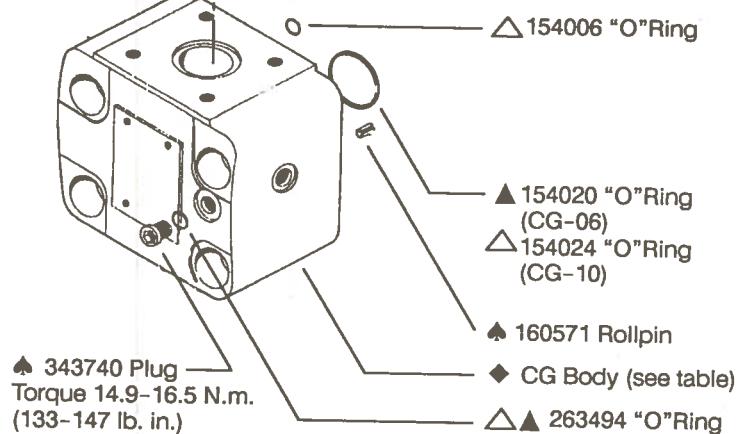
Sectional "E" vent head 1 or 3



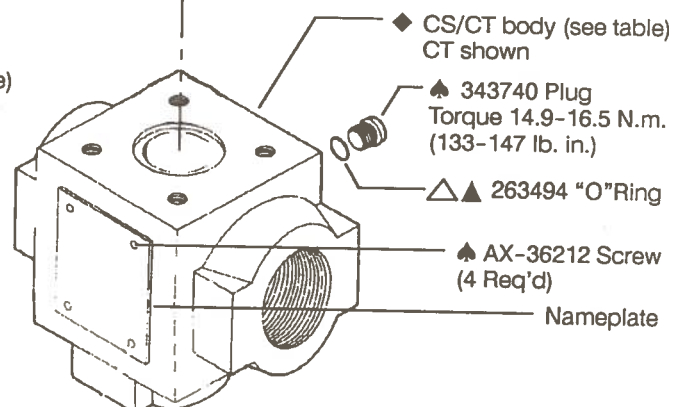
Model	Cover spring	Pressure range psi (bar)
C*-**-B	2280	125-1000 (8.5-70)
C*-**-C	583937	500-2000 (35-140)
C*-**-F	2281	1500-3000 (105-210)

♠ Part	Kit
1485	944064
AX-36212	944053
64520	944068
113000	944055
160571	944069
218750	944070
226816	944071
227405	944074
292230	944072
326317	944073
329463	944041
343740	944038

Parts with ♠ available only in kits of 25.  
Reference kit on parts order.

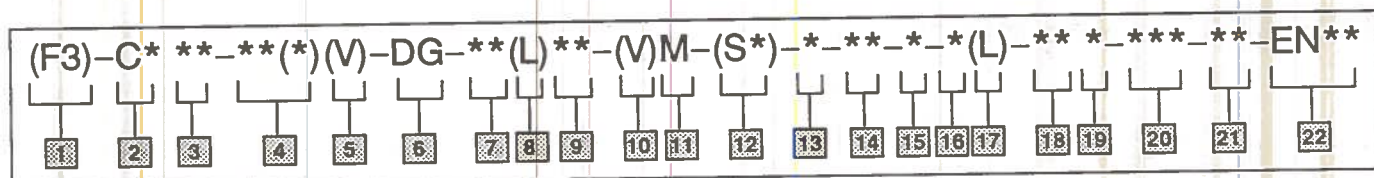


Model	◆ Body	
	-06	-10
CG	580456	581703
CS	581701	580430
CT	590348	590300



- ▲ Included in -06 F3 seal kit 919684
- ▲ Included in -10 F3 seal kit 919685
- Included in CT-06-BC cover kit 942155
- Included in CT-10-BC cover kit 942156
- ♠ Available only in kits of 25.
- ◆ Not available for sale

# Model Code



**1** Seals for mineral oil & fire resistant fluids

**2** Relief valve connections

G - Subplate mounting  
S - Straight threads  
T - NPTF threads

**3** Valve size

06 - 3/4"  
10 - 1-1/4"

**4** Pressure range

B - 125-1000 psi  
C - 500-2000 psi  
F - 1500-3000 psi  
E - Vent

**5** High vent

Blank - Omit for low vent models

**6** Directional valve

**7** Spool type & spring arrangement

0A(L) - Spring offset

**8** Left hand build

Omit for standard models

**9** Manual override options (included in pilot valve model code)

Blank - Plain override solenoid ends only  
H - Waterproof override solenoid ends only  
H2 - Waterproof override both ends of single solenoid  
M - Serviceable manual overrides in solenoid ends only  
P2 - Plain override both ends of single solenoid  
Y - Lockable manual overrides solenoid ends only  
Z - No overrides in either end

**10** Solenoid energization identity

Blank - Standard arrangement for ANSI B93.9 (energise solenoid A for flow P to A port)

V - Solenoid identification determined by position of solenoid. (Solenoid A at port A end and/or solenoid B at port B end. (All 4 & 8 spools are always V code)

**11** Flag symbol heading electrical options & features

**12** Spool position monitoring switch (tank pressure rating 10 bar only)

S1 - Switch, normally open, U coils only  
S2 - Switch, normally closed, U coils only  
S3 - Switch, wired normally open, P\*  
S4 - Switch, wired normally closed, P\*  
S5 - Switch, free leads, FW & FJ only  
Omit if not required

**13** Coil type

U - ISO 4400  
P - Plug in coil  
F - Flying lead  
SP1 - Single 6,3 series spade to IEC 760  
SP2 - Dual 6,3 series spade to IEC 760

**14** Electrical connections (F type coil only) omit if not required

T - Wired terminal block  
PA - Instaplug male receptacle only  
PB - Instaplug male & female receptacle  
PA3 - Three pin connector & terminal block  
PA5 - Five pin connector & terminal block

**15** Housing (F type coils only)

W - 1/2 NPT thread wiring housing  
J - 20 mm thread wiring housing

**16** Electrical options

1 - ISO with fitted plug, U type coils only  
7 - Surge damper, P type coils only  
9 - Rectifier (fast type) P type coils only  
12 - Rectifier (slow type) P type coils only

**17** Solenoid indicator lights (F build only) To be used with T terminal block models. (Omit if not required)

**18** Coil identification

**19** Pilot valve code (tank pressure rating)

2 - 10 bar (145 psi) use with switch models S\*  
5 - 100 bar (1450 psi) for all other models

**20** Pilot valve port orifices

**21** Design

40 - DG4V3S-60  
Standard pilot valve  
50 - DG4V3-60  
High performance pilot valve

**22** Special modifications (omit if not required)

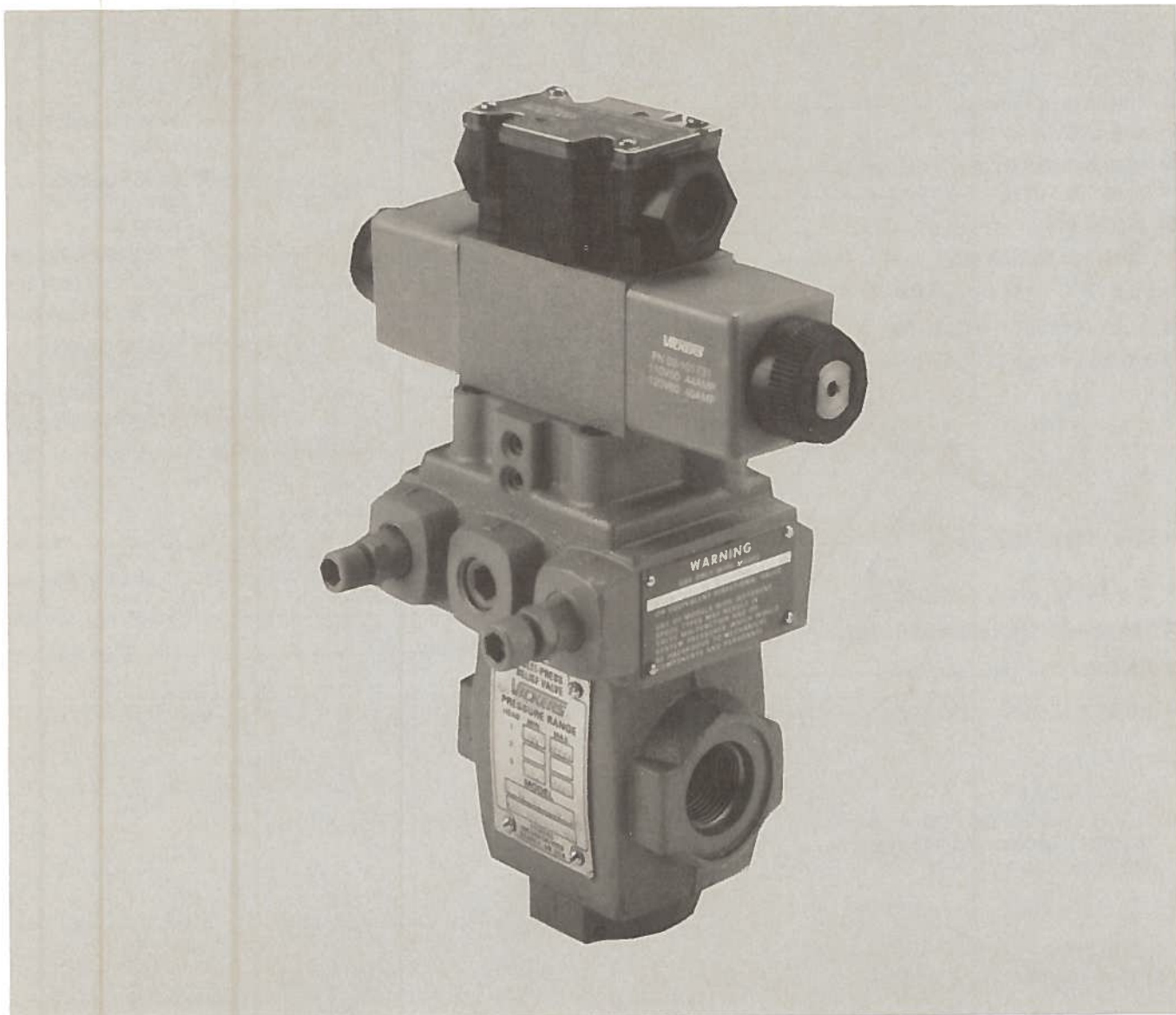
**7** Thru **20** Included in pilot valve model code

**VICKERS®**

A TRINHOVA COMPANY

## Multi-Pressure Relief Valves

(F3)-C/G/S/T-06/10\*\*(\*) (V)-DG-8C(L)\*\*-(V)M-(S\*)\*\*\*\*\* (L)\*\*\*\*\*-40/50



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.



NOTE: Lubricate all parts & seals with a thin coat of oil at assembly.

DG4V3(S)-8C(L)-60 Pilot valve (Refer to parts drawing for detailed information).

255698 Bolt kit (Torque 4.5-5.6 N.m.)  
40-50 lb.in. (Pilot valve to adapter plate mounting) Not shown

255651 Bolt kit (Torque 14.9-20.3 N.m.)  
11-15 lb.ft. (Adapter plate to cover mounting)

422814 Adapter plate

# WARNING

Use only a DG4V3(S)-8C-60 directional valve as a pilot for this relief valve. Use of a different pilot can block relief valve, causing excessive system pressure.

113000 Plug (4 Req'd)

262334 "O"Ring (4 Req'd)

1649 Ball (2 Req'd) (C\*-06 only)

Cover (see table)

290057 Piston (3 Req'd)

Cover spring (see table)

262332 "O"Ring (3 Req'd)

197570 BU-Ring (3 Req'd)

370701 Plunger (3 Req'd)

\* 292230 ADJ. screw (3 Req'd)

\* 1485 Locknut (3 Req'd)

\* 283949 Lockscrew (3 Req'd)

64520 Washer (As req'd)

326317 Washer (As req'd)

\* NOTE: Coat 292230 ADJ. screw, 283949 lockscrew and 1485 locknut with oil prior to assembly.

NOTE: These parts used at final test to obtain correct pressure range.

Model	Seat	Hydrocone	Lo-Vent spring	Hi-Vent spring	Cover
C*-06	343153	343154	2077	184458	370664
C*-10	283954	283952	291822	291821	370669

NOTE: Use either a Lo-Vent or Hi-Vent spring. Do not use both. (See model code)

263497 "O"Ring (2 Req'd)

329463 Plug (3 Req'd)  
Torque 52.8-58.3 N.m.  
(39-43 lb. ft.)

294656 Restrictor plug (3 Req'd) C\*-10 only

285601 Seat (3 Req'd)  
Assemble cross hole facing up

226816 Rollpin

Lockwasher (see table)

Screw (see table)

113000 Plug (C\*-06 5 Req'd)  
(C\*-10 7 Req'd)

370839 Warning plate

227405 Screw (4 Req'd)

Hi-Vent spring (C\*-10) See table

Lo-Vent spring (C\*-06/10) See table

Hi-Vent spring (C\*-06 only) See table

Hydrocone (see table)

Seat (see table)

262361 "O"Ring (C\*-06)  
262367 "O"Ring (C\*-10)

# NOTE:

For satisfactory service life of these components in industrial applications, use full flow filtration to provide fluid which meets ISO cleanliness code 18/15 or cleaner. OFP, OFR, and OFRS series filters are recommended.

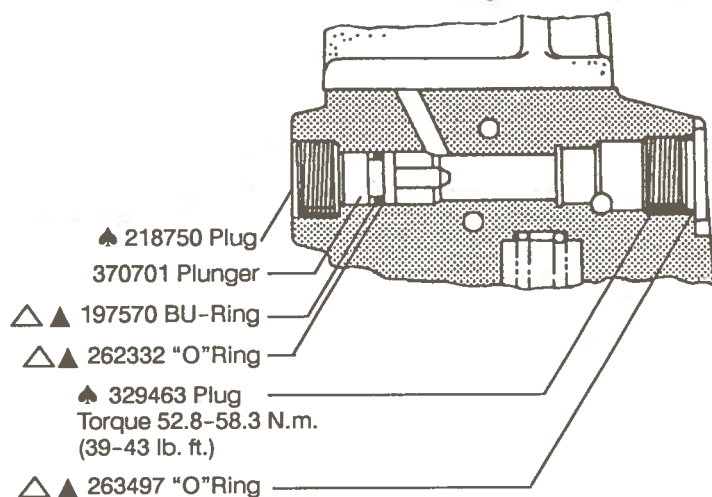
Model	Screw (4 Req'd)	Torque		Lock washer (4 Req'd)
		lb. ft.	N.m	
C*-06	1036	11-15	14.9-20.3	68907
C*-10	1076	35-43	47.5-58.3	68909

Cover kits for C\*-06-\*\*\* are available for several spring arrangements

Spring order in head 1 2 3	● Included in kit (-06 only)
-C B F-	● 942198
-C B C-	● 942202
-F F B-	● 942326

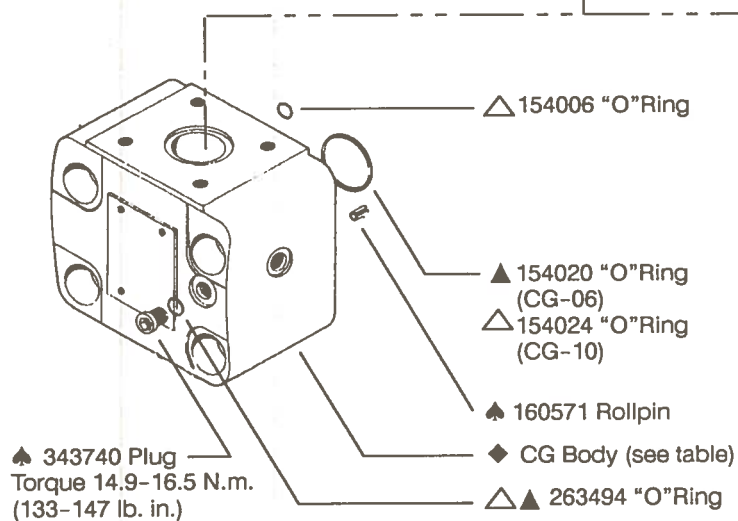
Model	Cover spring	Pressure range psi (bar)
C*-**-B	2280	125-1000 (8.5-70)
C*-**-C	583937	500-2000 (35-140)
C*-**-F	2281	1500-3000 (105-210)

Sectional "E" vent head 1, 2, or 3

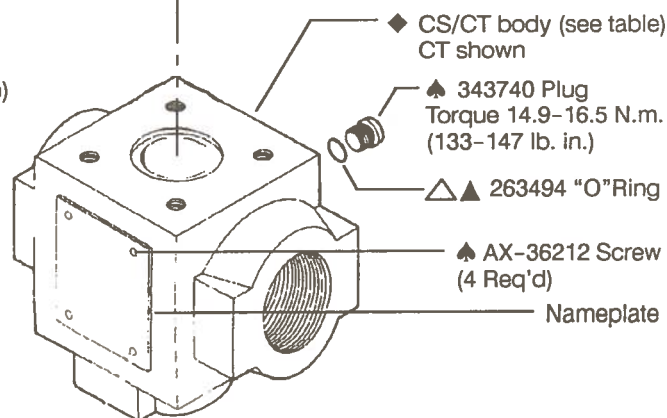


♠ Part	Kit
1485	944064
AX-36212	944053
1649	944067
64520	944068
113000	944055
160571	944069
218750	944070
226816	944071
227405	944074
292230	944072
326317	944073
329463	944041
343740	944038

Parts with ♠ available only in kits of 25.  
Reference kit on parts order.



Model	◆ Body	
	-06	-10
CG	580456	581703
CS	581701	580430
CT	590348	590300



▲ Included in -06 F3 seal kit 919684

△ Included in -10 F3 seal kit 919685

♠ Available only in kits of 25.

◆ Not available for sale

# Model Code

(F3)-C*		**-**(*)		(V)-DG-	**(L)**-		(V)M-(S*)		*-**-*-*(L)-**		*	***	**-EN**								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

**1** Seals for mineral oil & fire resistant fluids

**2** Relief valve connections

G - Subplate mounting  
S - Straight threads  
T - NPTF threads

**3** Valve size

06 - 3/4"  
10 - 1-1/4"

**4** Pressure range

B - 125-1000 psi  
C - 500-2000 psi  
F - 1500-3000 psi  
E - Vent

**5** High vent

Blank - Omit for low vent models

**6** Directional valve

**7** Spool type & spring arrangement

8C - Spring centered, Tri-pressure

**8** Left hand build

Omit for standard models

**9** Manual override options (included in pilot valve model code)

Blank - Plain override solenoid ends only  
H - Waterproof override solenoid ends only  
H2 - Waterproof override both ends of single solenoid  
M - Serviceable manual overrides in solenoid ends only  
P2 - Plain override both ends of single solenoid  
Y - Lockable manual overrides solenoid ends only  
Z - No overrides in either end

**10** Solenoid energization identity

Blank - Standard arrangement for ANSI B93.9 (energise solenoid A for flow P to A port)

V - Solenoid identification determined by position of solenoid. (Solenoid A at port A end and/or solenoid B at port B end. (All 4 & 8 spools are always V code)

**11** Flag symbol heading electrical options & features

**12** Spool position monitoring switch (tank pressure rating 10 bar only)

S1 - Switch, normally open, U coils only  
S2 - Switch, normally closed, U coils only  
S3 - Switch, wired normally open, P\*  
S4 - Switch, wired normally closed, P\*  
S5 - Switch, free leads, FW & FJ only  
Omit if not required

**13** Coil type

U - ISO 4400  
P - Plug in coil  
F - Flying lead  
SP1 - Single 6,3 series spade to IEC 760  
SP2 - Dual 6,3 series spade to IEC 760

**14** Electrical connections (F type coil only) omit if not required

T - Wired terminal block  
PA - Instaplug male receptacle only  
PB - Instaplug male & female receptacle  
PA3 - Three pin connector & terminal block  
PA5 - Five pin connector & terminal block

**15** Housing (F type coils only)

W - 1/2 NPT thread wiring housing  
J - 20 mm thread wiring housing

**16** Electrical options

1 - ISO with fitted plug, U type coils only  
7 - Surge damper, P type coils only  
9 - Rectifier (fast type) P type coils only  
12 - Rectifier (slow type) P type coils only

**17** Solenoid indicator lights (F build only) To be used with T terminal block models. (Omit if not required)

**18** Coil identification

**19** Pilot valve code (tank pressure rating)

2 - 10 bar (145 psi) use with switch models S\*  
5 - 100 bar (1450 psi) for all other models

**20** Pilot valve port orifices

**21** Design

40 - DG4V3S-60  
Standard pilot valve  
50 - DG4V3-60  
High performance pilot valve

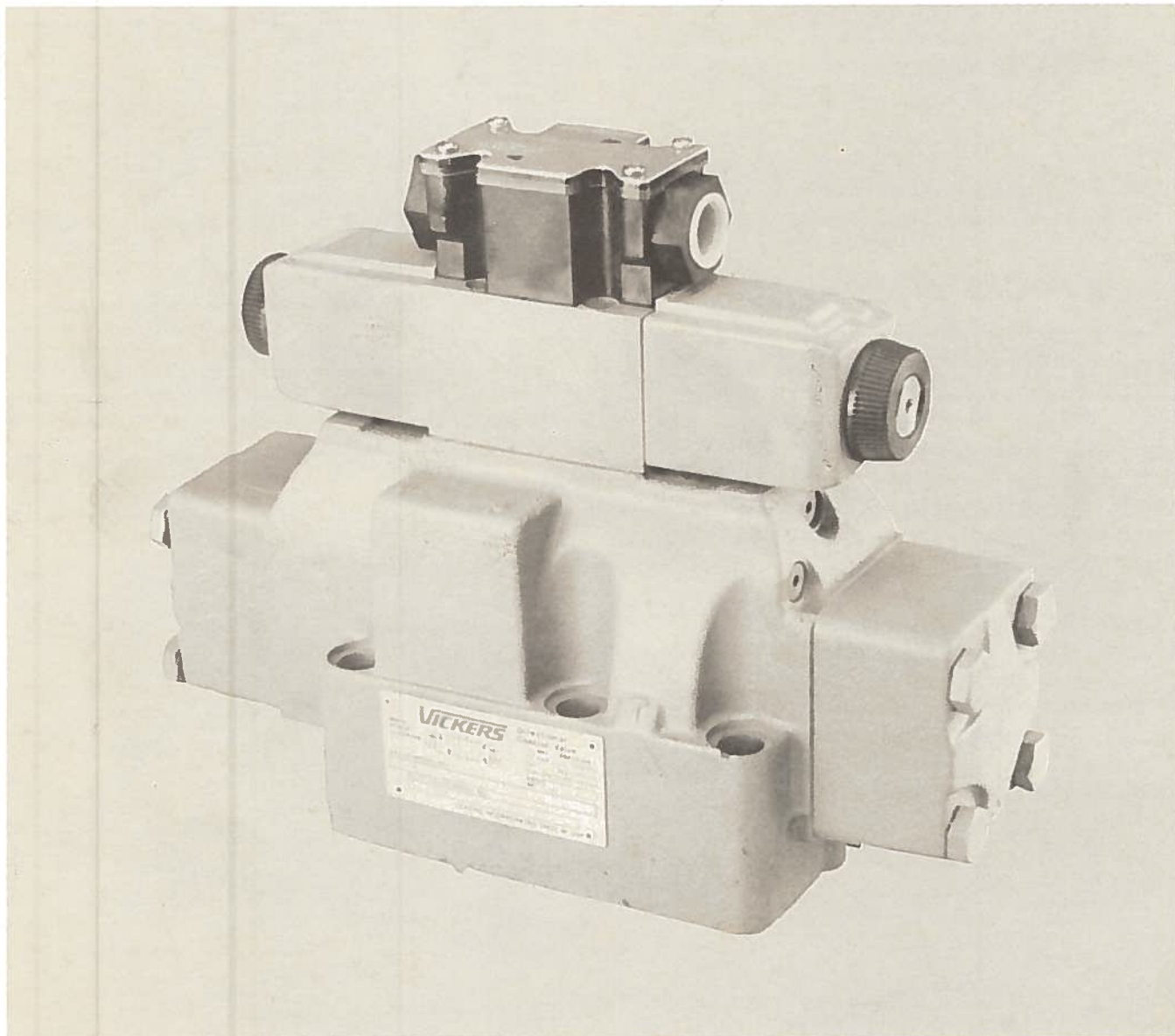
**22** Special modifications (omit if not required)

**7** Thru **20** Included in pilot valve model code



# Solenoid Controlled Pilot Operated Directional Valve

DG5S-8-\*D(L)-(\*) (X)-(\*)-(E)-(T)(\*)-(V)M-(S\*)-\*(\*\*)\*\*(L)-\*\*\*-\*\*\*-30/40



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.

Parts shown included in stroke ADJ. kit 941154. Stroke ADJ. CYL. "B" end only.

470843 Screw (4 Req'd)  
Torque 49-59 N.m.  
(36-44 lb. ft.)

135369 ADJ. Screw

289339 Cover

▲ 262330  
O-Ring

▲ 262402  
O-Ring

223075 Piston

1489 Nut

■ PLUG	TORQUES (OILED)	
	N.m.	lb. in.
113000	5.0-5.9	45-52
237588		
343740	15.0-16.0	133-142
398071	9.8-10.2	87-90
407533	12.1-12.4	107-110

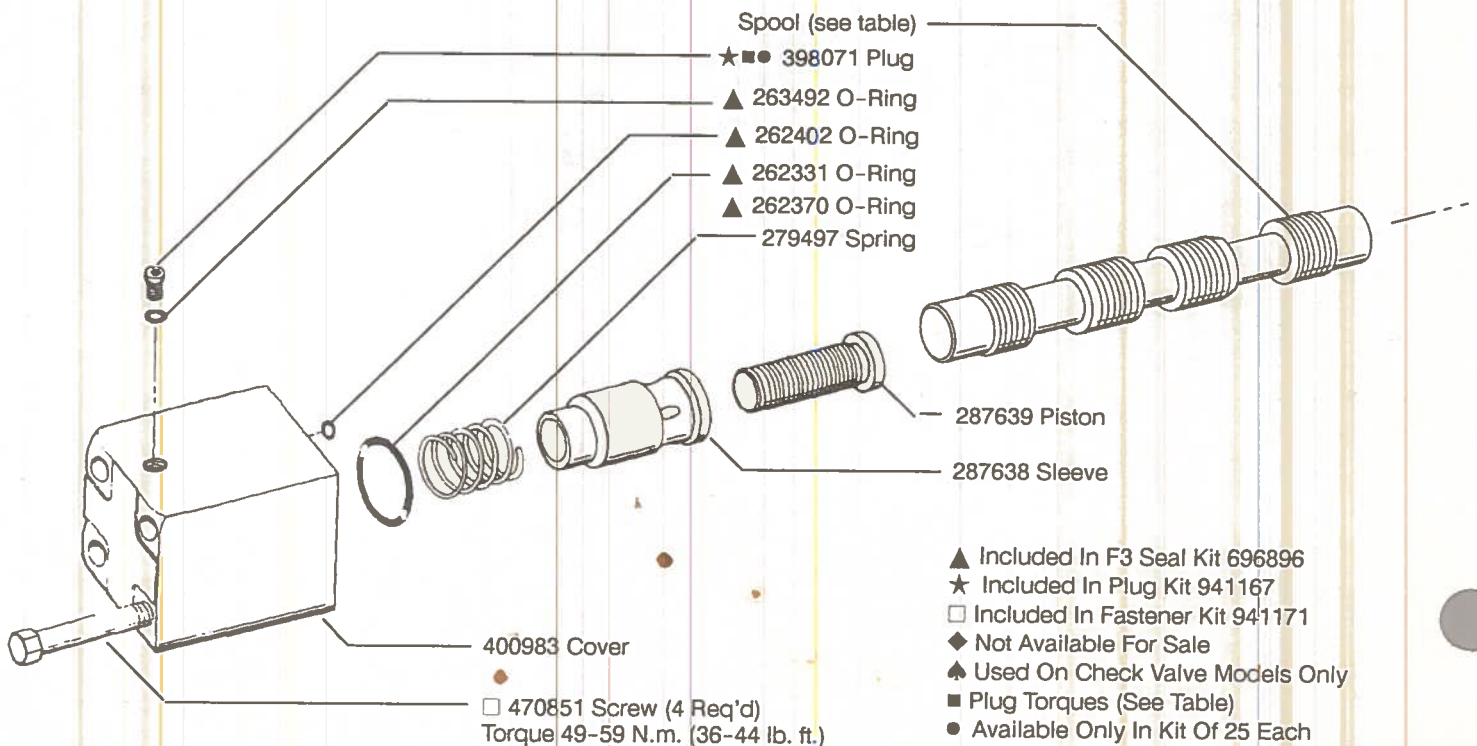
VALVE MODEL CODE	MAIN STAGE SPOOL TYPE	PILOT VALVE MODEL CODE
DG5S-8-*D-30	O, 1, 2, 3, 6, 9,	DG4V-3S-7C-60
DG5S-8-*D-40	11, 31, 33	DG4V-3-7C-60
DG5S-8-*D-30	4 & 8	DG4V-3S-78C-60
DG5S-8-*D-40		DG4V-3S-78C-60

See pilot valve service drawing for parts breakdown

MAIN STAGE SPOOL TYPE	SPOOL	ID PLATE
DG5S-8-OD	363495	400967
DG5S-8-1D	*276623	400968
DG5S-8-2D	363496	400969
DG5S-8-3D	*276625	400970
DG5S-8-4D	276626	400971
DG5S-8-6D	363498	400972
DG5S-8-8D	363499	400971
DG5S-8-9D	363500	400967
DG5S-8-11D	*276623	573685
DG5S-8-31D	*276625	573685
DG5S-8-33D	363501	400972

**\* SPOOL ASSEMBLY NOTE**

Assemble type 1 & 3 spools with narrow center land toward "A" end of valve.  
"A" end is defined as being closest to CYL. port "A". Type 11 & 31 spools are installed in reverse of type 1 & 3 with narrow center lands toward "B" end of valve.



# PILOT STAGE BOLT KIT (INCLUDES 4 ATTACHING BOLTS)

MODEL	BOLT KIT
W/O Pilot choke	696892
W/ Pilot choke	696893
Torque 4.5-5.7 N. m. (39.8-50.4 lb. in.)	
See pilot choke service drawing for parts breakdown	

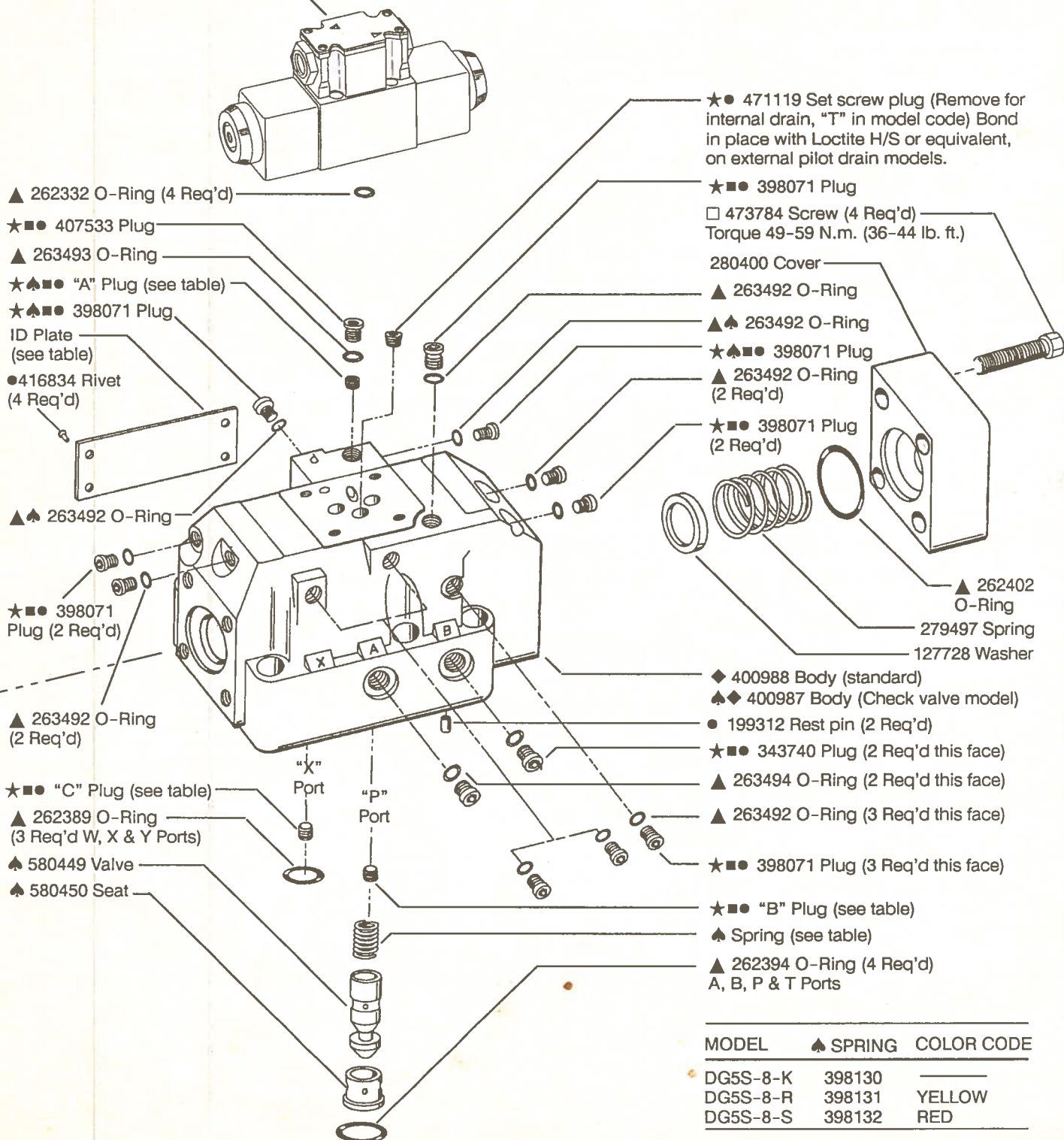
Pilot valve see table and refer to service drawing for more detailed information.

## ■ PLUG INSTALLATION TABLE

MODEL	"A" PLUG	"B" PLUG	"C" PLUG
DG5S-8-*D-**-	DOES NOT EXIST	237588	—
DG5S-8-*D-**-E		113000	237588
DG5S-8-*D-**-X		—	—
DG5S-8-*D-**-X-E		113000	—
DG5S-8-*D-**-KRS	237588	DOES NOT EXIST	—
DG5S-8-*D-**-E-KRS	113000		237588
DG5S-8-*D-**-X-KRS	—		—
DG5S-8-*D-**-X-E-KRS	113000		—

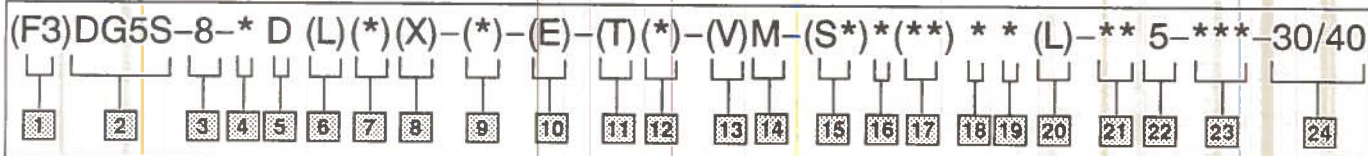
113000 Solid plug

237588 Orifice plug





# Model Code



**1** Seals for mineral oil & fire resistant fluids

**2** Directional control valve  
Manifold or subplate mounted  
Solenoid controlled  
Pilot operated  
Rated pressure 210 Bar (3000 psi)

**3** Interface  
8 - NFPA-D06 (ISO-4401-08)

**4** Spool type (see table)

**5** Spool/Spring arrangement  
D - Pressure centered

**6** Left hand  
L - Left hand (single solenoid only)  
Blank - Omit when not required

**7** Manual override option  
Blank - Plain override solenoid ends only  
H - Waterproof override solenoid ends only  
H2 - Waterproof override both ends of single solenoid  
P2 - Plain override both ends of single solenoid  
Y - Lockable manual overrides solenoid ends only/DC only  
Z - No overrides in either end

**8** Response type  
X - Fast response  
Blank - Standard low shock models

**9** Spool control modifications

2 - Pilot choke adjustment  
8 - Stroke adjustment CYL. B only  
2-8 - Dual pilot choke & stroke ADJ. B port end only  
Blank - Omit when not required

**10** Pilot pressure  
E - External pilot pressure  
Omit - Internal pilot pressure

**11** Pilot drain  
T - Internal pilot Drain  
Omit - External pilot drain

**12** Pressure port check valve  
K - 0.35 bar (5 psi cracking pressure)  
R - 3.45 bar (50 psi cracking pressure)  
S - 5.20 bar (75 psi cracking pressure)  
Blank - Omit when not required

**13** Solenoid energization identity  
Blank - Standard arrangement for ANSI B93.9 (energise solenoid A for flow P to A port)  
V - Solenoid identification determined by position of solenoid. (Solenoid A at port A end and/or solenoid B at port B end. (All 4 & 8 spools are always V code)

**14** Flag symbol heading electrical options & features

**15** Spool indicator switch  
Available on high performance models, DG4V-3, only.  
Omit when not required.

S1 - Options available on U only)  
S2 - Options available on U only)  
S3 - Options available on P\* only  
S4 - Options available on P\* only  
S5 - Options available on FW/FJ only

**16** Coil type

U - ISO 4400  
F - Flying lead  
SP1 - Single 6,3 MM spade to IEC 760  
SP2 - Dual 6,3 MM spade to IEC 760

**17** Electrical connections (F type coil only) omit if not required

T - Wired terminal block  
PA - Instaplug male receptacle only  
PB - Instaplug male & female receptacle  
PA3 - Three pin connector  
PA5 - Five pin connector

**18** Housing (F type coils only)  
W - 1/2 NPT thread wiring housing  
J - 20 mm thread wiring housing

**19** Electrical options  
1 - ISO with fitted plug, U type coils only  
6 - ISO with fitted plug, & lights  
U type coils only

**20** Solenoid indicator lights (F build only) used with T terminal block models. (Omit if not required)

**21** Coil identification

**22** Pilot valve code (tank pressure rating)

2 - 10 bar (145 psi) DG4V3-60  
5 - 100 bar (1450 psi) DG4V3S-60  
6 - 160 bar (2285 psi) DG4V3-60  
7 - 210 bar (3000 psi) DG4V3-60

**23** Pilot valve port orifices

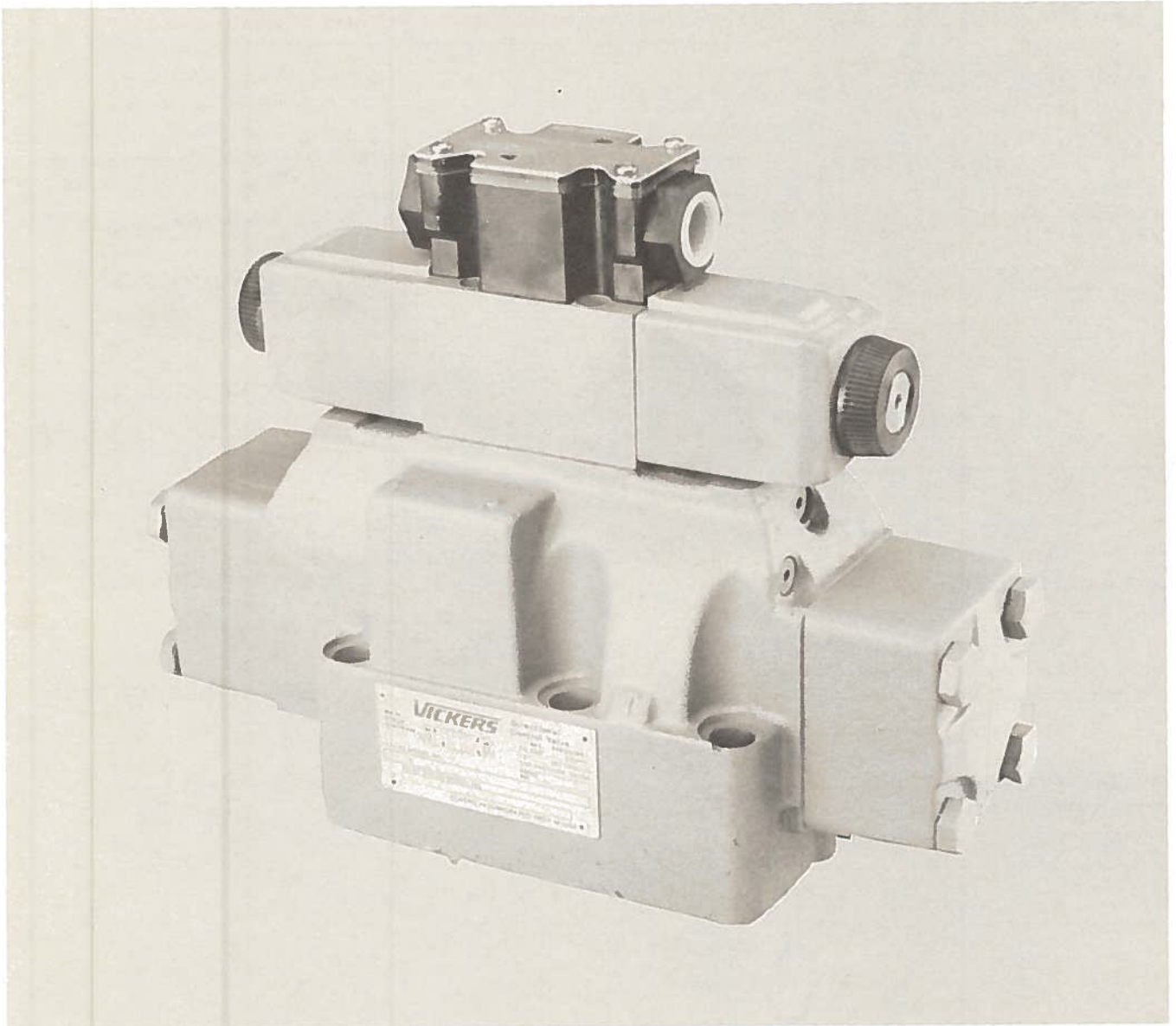
**24** Design

30 - DG4V3S-60 pilot valve  
40 - DG4V3-60 pilot valve

**6** Thru **23** included in pilot valve model code

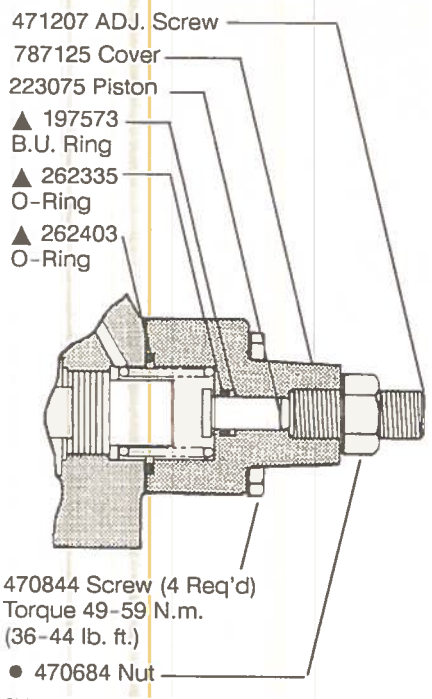
# Solenoid Controlled Pilot Operated Directional Valve

DG5S-H8-\*\*(L)-(\*) (X)-(\*)-(E)-(T)(\*)-(V)M-(S\*)-\*(\*\*)\*\*(L)-\*\*\*-\*\*\*-60/70



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.

Parts shown included in stroke ADJ. kit 941156. Order two kits if stroke ADJ. is required both ends.



■ PLUG	TORQUES (OILED)	
	N.m.	lb. in.
113000	5.0-5.9	45-52
237588		
343740	15.0-16.0	133-142
398071	9.8-10.2	87-90
407533	12.1-12.4	107-110

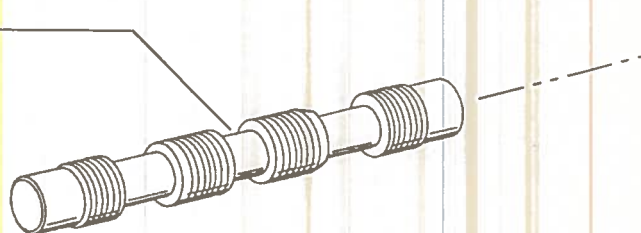
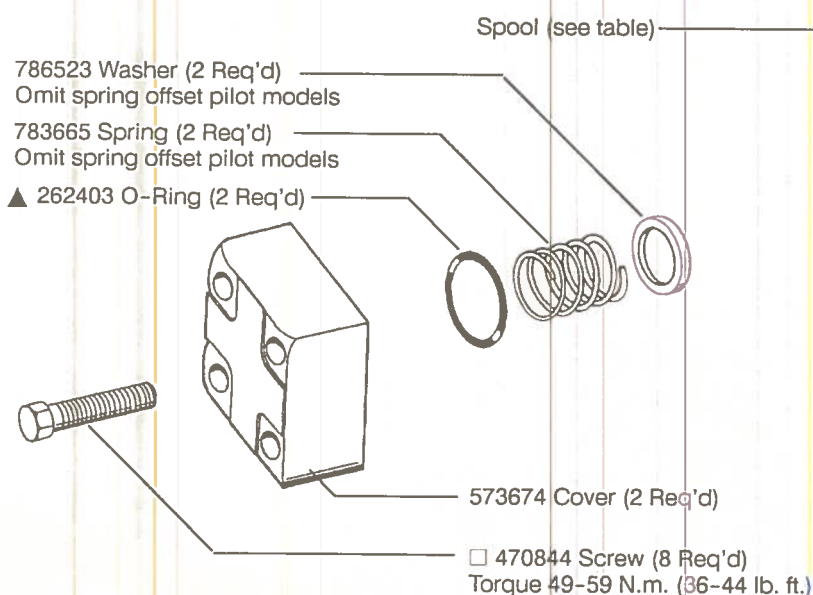
MAIN STAGE SPOOL TYPE	AVAILABLE VALVE TYPE	SPOOL	MAIN STAGE ID PLATE	
			"A" ONLY	B/C/F/N
0	A/B/C//N	786350	400975	400976
1		*786557		400977
2		786349		400978
3		*786558		400979
4		628162		400980
6		786559		400981
8		627221		400980
9		786561		400976
11		*786557		632700
31		*786558		580475
33		786562		400981

**\* SPOOL ASSEMBLY NOTE**

Assemble type 1 & 3 spools with narrow center land toward "A" end of valve. "A" end is defined as being closest to CYL. port "A". Type 11 & 31 spools are installed in reverse of type 1 & 3 with narrow center lands toward "B" end of valve.

VALVE MODEL CODE	MAIN STAGE SPOOL TYPE	PILOT VALVE MODEL CODE
DG5S-H8-*A-60	O, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3S-2A-60
DG5S-H8-*A-70		DG4V-3-2A-60
DG5S-H8-*A-60		DG4V-3S-28A-60
DG5S-H8-*A-70	4 & 8	DG4V-3-28A-60
DG5S-H8-*B-60	O, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3S-6B-60
DG5S-H8-*B-70		DG4V-3-6B-60
DG5S-H8-*B-60		DG4V-3S-68B-60
DG5S-H8-*B-70	4 & 8	DG4V-3-68B-60
DG5S-H8-*C-60	O, 1, 2, 3, 6, 9, 11, 31, 33, 52, 521	DG4V-3S-6C-60
DG5S-H8-*C-70		DG4V-3-6C-60
DG5S-H8-*C-60		DG4V-3S-68C-60
DG5S-H8-*C-70	4 & 8	DG4V-3-68C-60
DG5S-H8-*N-60	O, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3S-6N-60
DG5S-H8-*N-70		DG4V-3-6N-60
DG5S-H8-*N-60		DG4V-3S-68N-60
DG5S-H8-*N-70	4 & 8	DG4V-3-68N-60

See pilot valve service drawing for parts breakdown



- ▲ Included In F3 Seal Kit 696895
- ★ Included In Plug Kit 941167
- Included In Fastener Kit 941175
- ◆ Not Available For Sale
- ♣ Used On Check Valve Models Only
- Plug Torques (See Table)
- Available Only In Kit Of 25 Each



**PILOT STAGE BOLT KIT (INCLUDES 4 ATTACHING BOLTS)**

MODEL	BOLT KIT
W/O Pilot choke	696892
W/ Pilot choke	696893
Torque 4.5-5.7 N. m. (39.8-50.4 lb. in.)	
See pilot choke service drawing for parts breakdown	

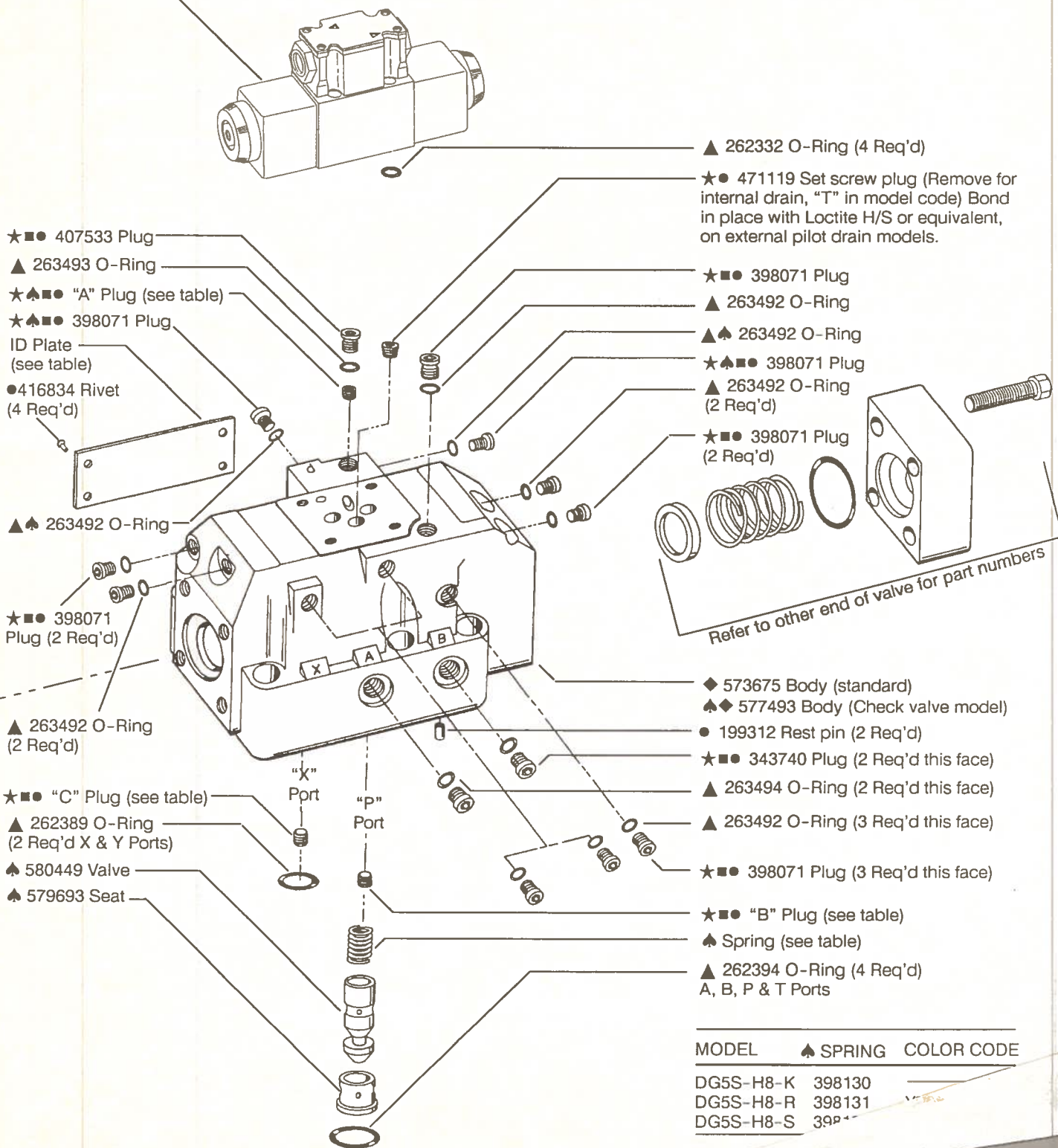
This solenoid removed on right hand A & B models. Refer to service drawings for more detailed information on left hand valves.

**■ PLUG INSTALLATION TABLE**

MODEL	"A" PLUG	"B" PLUG	"C" PLUG
DG5S-H8-**-	DOES NOT EXIST	237588	—
DG5S-H8-**-E		113000	237588
DG5S-H8-**-X		—	—
DG5S-H8-**-X-E	—	113000	—
DG5S-H8-**-KRS	237588	DOES NOT EXIST	—
DG5S-H8-**-E-KRS	113000		237588
DG5S-H8-**-X-KRS	—		—
DG5S-H8-**-X-E-KRS	113000	—	—

★ 113000 Solid plug

★ 237588 Orifice plug



MODEL	♠ SPRING	COLOR CODE
DG5S-H8-K	398130	—
DG5S-H8-R	398131	—
DG5S-H8-S	398132	—

# Model Code

(F3)DG5S-H8-\* \* (L)(\*)(X\*)(E)-(T)(\*)-(V)M-(S\*)(\*\*)\* \* (L)-\*\* 5-\*\*\*-60/70

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

**1** Seals for mineral oil & fire resistant fluids

**2** Directional control valve  
Manifold or subplate mounted  
Solenoid controlled  
Pilot operated  
Rated pressure 310 Bar (4500 psi)

**3** High flow interface  
8 - NFPA-D06 (ISO-4401-08)

**4** Spool type (see table)

**5** Spool/Spring arrangement

A - Spring offset, to CYL. A  
B - Spring centered, sol. A removed  
C - Spring centered  
F - Spring offset, to CYL. A shift to center  
N - No spring detented

**6** Left hand

L - Left hand (single solenoid only)  
Blank - Omit when not required

**7** Manual override option

Blank - Plain override solenoid ends only  
H - Waterproof override solenoid ends only  
H2 - Waterproof override both ends of single solenoid  
P2 - Plain override both ends of single solenoid  
Y - Lockable manual overrides solenoid ends only/DC only  
Z - No overrides in either end

**8** Response type

X - Fast response  
Blank - Standard low shock models

**9** Spool control modifications

1 - Stroke adjustment  
2 - Pilot choke adjustment  
3 - Pilot choke & stroke adjustment  
7 - Stroke adjustment CYL. A only  
8 - Stroke adjustment CYL. B only  
2-7 - Dual pilot choke & stroke ADJ. A port end only  
2-8 - Dual pilot choke & stroke ADJ. B port end only  
Blank - Omit when not required

**10** Pilot pressure

E - External pilot pressure  
Omit - Internal pilot pressure

**11** Pilot drain

T - Internal pilot Drain  
Omit - External pilot drain

**12** Pressure port check valve

K - 0.35 bar (5 psi cracking pressure)  
R - 3.45 bar (50 psi cracking pressure)  
S - 5.20 bar (75 psi cracking pressure)  
Blank - Omit when not required

**13** Solenoid energization identity

Blank - Standard arrangement for ANSI B93.9 (energise solenoid A for flow P to A port)  
V - Solenoid identification determined by position of solenoid. (Solenoid A at port A end and/or solenoid B at port B end. (All 4 & 8 spools are always V code)

**14** Flag symbol heading electrical options & features

**15** Spool indicator switch

Available on high performance models, DG4V-3, only.  
Omit when not required.

S1 - Options available on U only)  
S2 - Options available on U only)  
S3 - Options available on P\* only  
S4 - Options available on P\* only  
S5 - Options available on FW/FJ only

**16** Coil type

U - ISO 4400  
F - Flying lead  
SP1 - Single 6,3 MM spade to IEC 760  
SP2 - Dual 6,3 MM spade to IEC 760

**17** Electrical connections (F type coil only) omit if not required

T - Wired terminal block  
PA - Instaplug male receptacle only  
PB - Instaplug male & female receptacle  
PA3 - Three pin connector  
PA5 - Five pin connector

**18** Housing (F type coils only)

W - 1/2 NPT thread wiring housing  
J - 20 mm thread wiring housing

**19** Electrical options

1 - ISO with fitted plug, U type coils only  
6 - ISO with fitted plug, & lights  
U type coils only

**20** Solenoid indicator lights (F build only) used with T terminal block models. (Omit if not required)

**21** Coil identification

**22** Pilot valve code (tank pressure rating)

2 - 10 bar (145 psi) DG4V3-60  
5 - 100 bar (1450 psi) DG4V3S-60  
6 - 160 bar (2285 psi) DG4V3-60  
7 - 210 bar (3000 psi) DG4V3-60

**23** Pilot valve port orifices

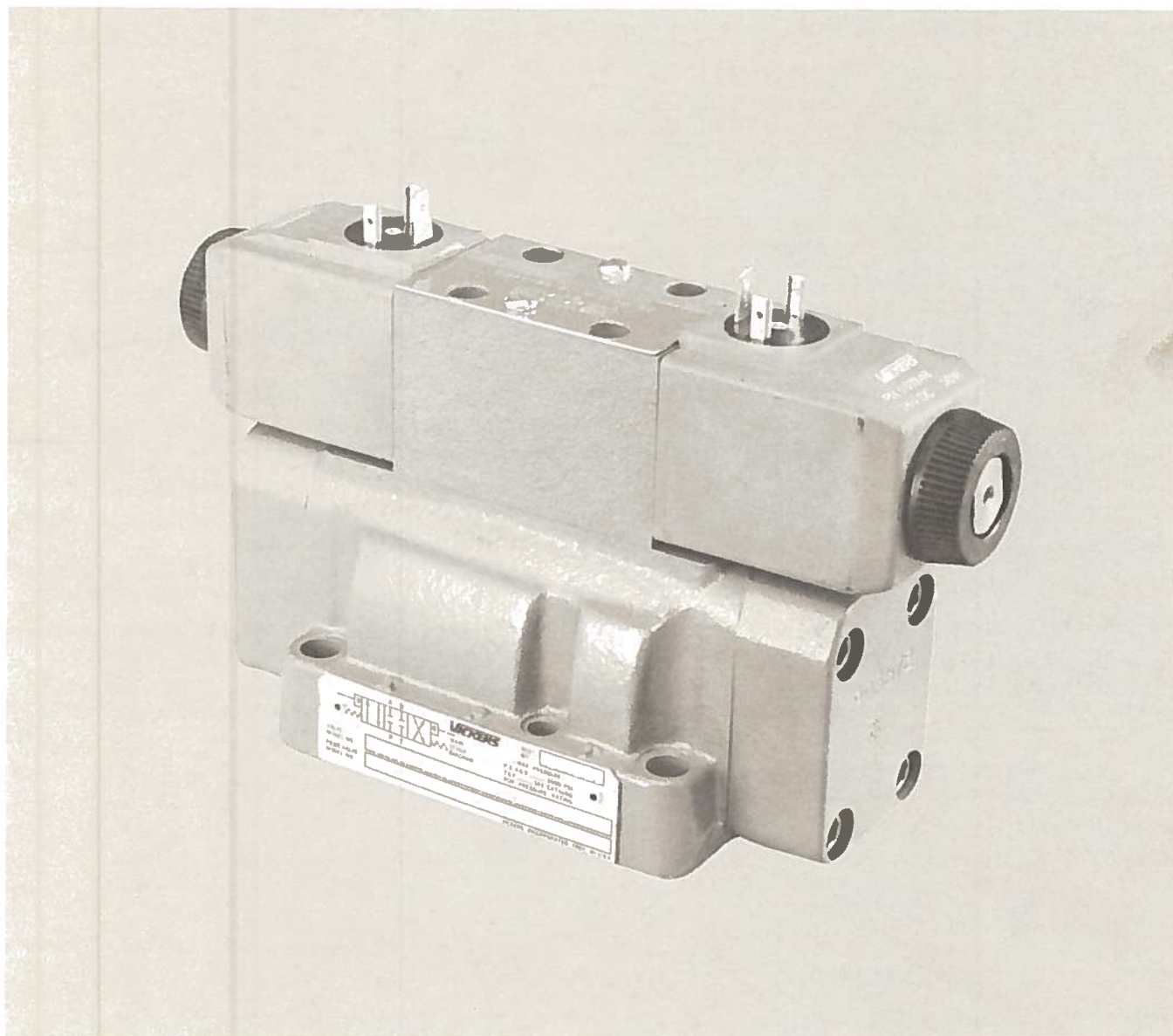
**24** Design

60 - DG4V3S-60 pilot valve  
70 - DG4V3-60 pilot valve

**6** Thru **23** included in pilot valve model code

# Solenoid Controlled Pilot Operated Directional Valves

(F3)DG5S4-04-\*\*(L)(\*\*)(X)(\*)(E)(T)(\*)-(V)M-(S\*)\*(\*\*)\*\*(L)\*\*5-\*\*\*-60/70



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.



MAIN STAGE SPOOL TYPE	AVAILABLE VALVE TYPE	SPOOL	MAIN STAGE ID PLATE	
			"A" ONLY	B/C/N
O	A/B/C/N	399891	433851	433852
1		*431972		433851
2		399892		433853
3		*399893		433854
4		413481		433855
6		399894		433856
8		399896		433855
9		413483		433852
11		*431972		433851
31		*399893		433851
33		399897		433856

**\* SPOOL ASSEMBLY NOTE**

Assemble type 1 & 3 spools with narrow center land toward "A" end of valve. "A" end is defined as being closest to CYL. port "A". Type 11 & 31 spools are installed in reverse of type 1 & 3 with narrow center lands toward "B" end of valve.

**■ PLUG TORQUES (OILED)**

PLUG	N.M	lb. in.
7074	8.5-9.6	75-85
113000	5.0-5.9	45-52
367427	5.0-5.9	45-52

**■ PLUG INSTALLATION TABLE**

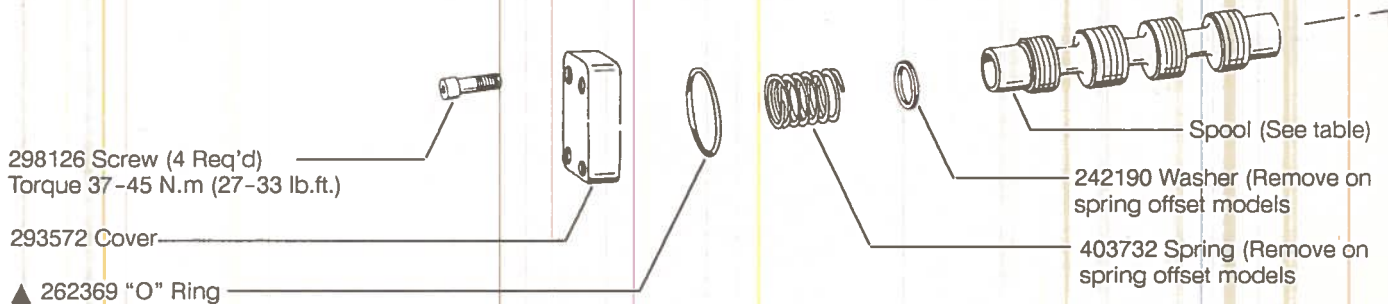
MODEL	"A" PLUG	"B" PLUG	"C" PLUG
DG5S4-04*	DOES NOT EXIST	367427	OUT
DG5S4-04*-E		113000	367427
DG5S4-04*-X		OUT	OUT
DG5S4-04*-X-E		113000	
DG5S4-04*-K/R/S	367427		326427
DG5S4-04*-E-K/R/S	113000		
DG5S4-04*-X-K/R/S	OUT	OUT	
DG5S4-04*-X-E-K/R/S	113000		

★ 113000 SOLID PLUG

★ 367427 ORIFICE PLUG

**NOTE**

Parts included in service kits are not sold separately.



VALVE MODEL CODE	MAIN STAGE SPOOL TYPE	PILOT VALVE MODEL CODE
DG5S4-04*A	O, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3(S)-2A-60
	4 & 8	DG4V-3(S)-28A-60
DG5S4-04*B	O, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3(S)-6B-60
	4 & 8	DG4V-3(S)-68B-60
DG5S4-04*C	O, 1, 2, 3, 6, 9, 11, 31, 33, 52, 521	DG4V-3(S)-6C-60
	4 & 8	DG4V-3(S)-68C-60
DG5S4-04*N	O, 1, 2, 3, 6, 9, 11, 31, 33	DG4V-3(S)-6N-60
	4 & 8	DG4V-3(S)-68N-60

See pilot valve service drawing for parts breakdown

- ▲ Included In F3 Seal Kit 696897
- ★ Included In Plug Kit 926545
- ◆ Not Available For Sale
- ♠ Used On Check Valve Models Only
- Plug Torques (See Table)
- Available Only In Kit Of 25 Each

MODEL	SPRING
DG5S4-04-K	426859
DG5S4-04-R	418675
DG5S4-04-S	432350

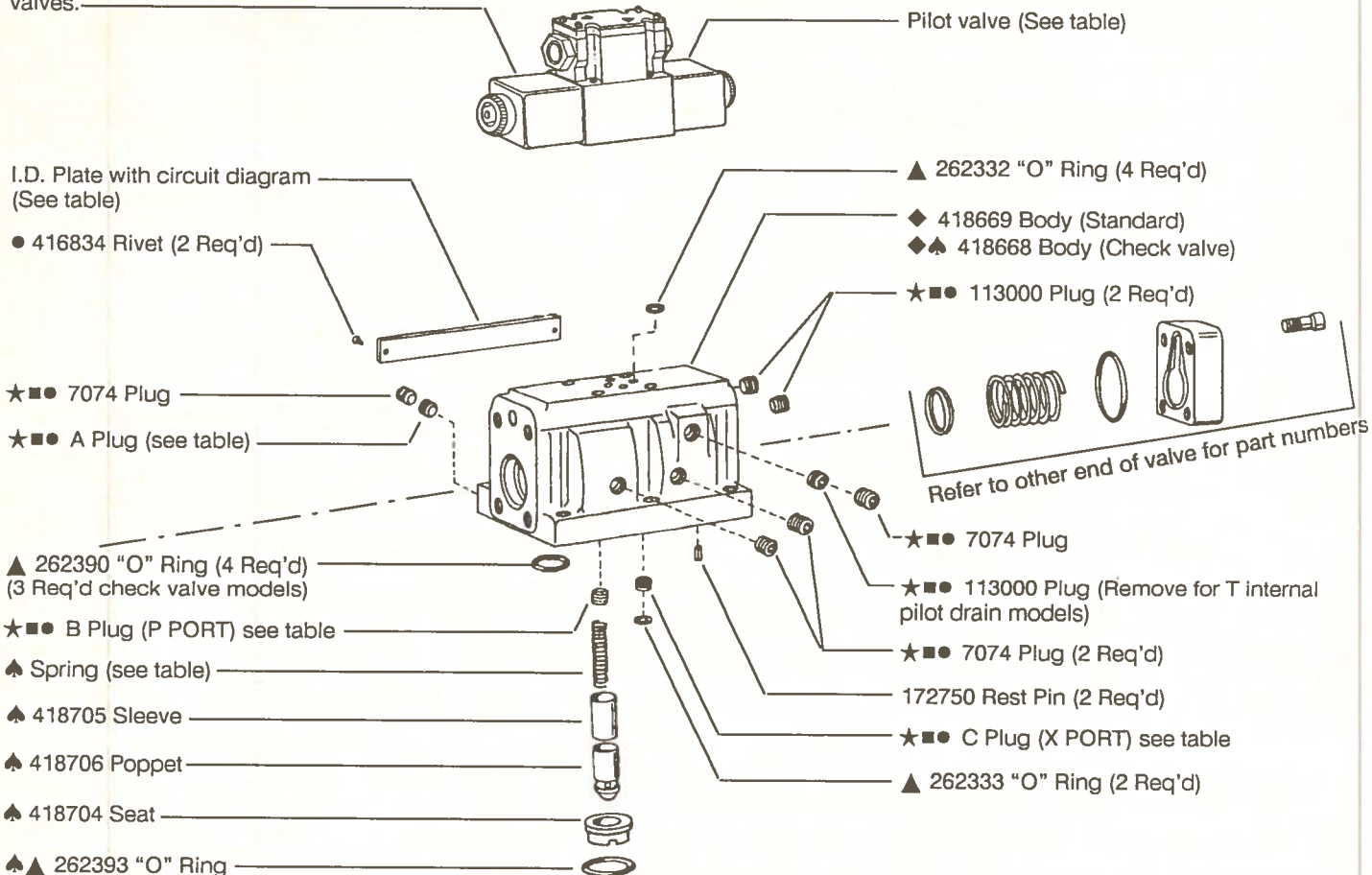
# PILOT STAGE BOLT KIT (INCLUDES 4 ATTACHING BOLTS)

MODEL	BOLT KIT
W/O Pilot choke	696899
W/ Pilot choke	696900

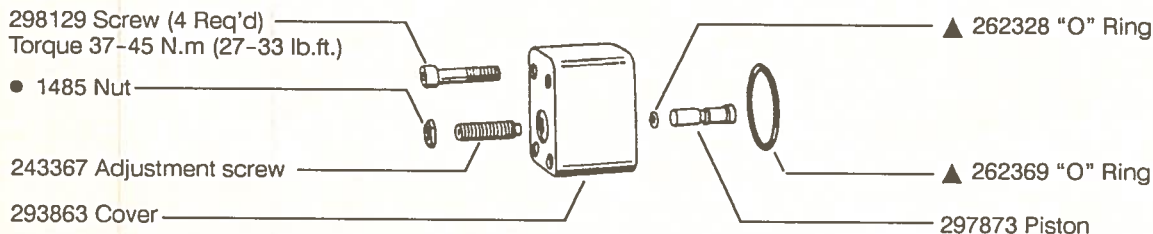
Torque 4.5-5.7 N. m. (39.8-50.4 lb. in.)

See pilot choke service drawing for parts breakdown

This solenoid removed on right hand A, & B, models. Refer to service drawings for more detailed information on left hand valves.



Parts shown included in 941029 stroke adjustment kit. Order two kits if stroke adjustment is required for both ends.



Stroke adjustment parts either end or both

## NOTE

For satisfactory service life of these components in industrial applications, use full flow filtration to provide fluid which meets ISO cleanliness code 18/15 or cleaner.

# Model Code

(F3)DG5S4-04-\* \* (L)(\*\*)(X)(\*)(E)(T)(\*)-(V)M-(S\*)\*(\*\*)\* \*(L)\*\* \*-\*\*\*-60/70



**1** Seals for mineral oil & fire resistant fluids

**2** Directional control valve  
Manifold or subplate mounted  
Solenoid controlled  
Pilot operated  
Rated pressure 210 bar (3000 psi)

**3** Interface

04 - NFPA-D04 (ISO-4401-07)

**4** Spool type (see table)

**5** Spool/Spring arrangement

A - Spring offset, to CYL. A  
B - Spring centered, sol. A removed  
C - Spring centered  
F - Spring offset, to CYL. A shift to center  
N - No spring detented

**6** Left hand

L - Left hand (single solenoid only)  
Blank - Omit when not required

**7** Manual override option

Blank - Plain override solenoid ends only  
H - Waterproof override solenoid ends only  
H2 - Waterproof override both ends of single solenoid  
P2 - Plain override both ends of single solenoid  
Y - Lockable manual overrides solenoid ends only/DC only  
Z - No overrides in either end

**8** Response type

X - Fast response  
Blank - Standard low shock models

**9** Spool control modifications

1 - Stroke adjustment  
2 - Pilot choke adjustment  
3 - Pilot choke & stroke adjustment  
7 - Stroke adjustment CYL. A only  
8 - Stroke adjustment CYL. B only  
2-7 - Dual pilot choke & stroke ADJ. A port end only  
2-8 - Dual pilot choke & stroke ADJ. B port end only  
Blank - Omit when not required

**10** Pilot pressure

E - External pilot pressure  
Omit - Internal pilot pressure

**11** Pilot drain

T - Internal pilot Drain  
Omit - External pilot drain

**12** Pressure port check valve

K - 0.35 bar (5 psi) cracking pressure  
R - 3.45 bar (50 psi) cracking pressure  
S - 5.20 bar (75 psi) cracking pressure  
Blank - Omit when not required

**13** Solenoid energization identity

Blank - Standard arrangement for ANSI B93.9 (energise solenoid A for flow P to A port)  
V - Solenoid identification determined by position of solenoid. (Solenoid A at port A end and/or solenoid B at port B end. (All 4 & 8 spools are always V code)

**14** Flag symbol heading electrical options & features

**15** Spool indicator switch

Available on high performance models, DG4V-3, only.  
Omit when not required.

S1 - Options available on U only)  
S2 - Options available on U only)  
S3 - Options available on P\* only  
S4 - Options available on P\* only  
S5 - Options available on FW/FJ only

**16** Coil type

U - ISO 4400  
F - Flying lead  
SP1 - Single 6.3 MM spade to IEC 760  
SP2 - Dual 6.3 MM spade to IEC 760

**17** Electrical connections (F type coil only) omit if not required

T - Wired terminal block  
PA - Instaplug male receptacle only  
PB - Instaplug male & female receptacle  
PA3 - Three pin connector  
PA5 - Five pin connector

**18** Housing (F type coils only)

W - 1/2 NPT thread wiring housing  
J - 20 mm thread wiring housing

**19** Electrical options

1 - ISO with fitted plug, U type coils only  
6 - ISO with fitted plug, & lights  
U type coils only

**20** Solenoid indicator lights (F build only) used with T terminal block models. (Omit if not required)

**21** Coil identification

**22** Pilot valve code (tank pressure rating)

2 - 10 bar (145 psi) DG4V3-60  
5 - 100 bar (1450 psi) DG4V3S-60  
6 - 160 bar (2285 psi) DG4V3-60  
7 - 210 bar (3000 psi) DG4V3-60

**23** Pilot valve port orifices

**24** Design

60 - DG4V3S-60 pilot valve  
70 - DG4V3-60 pilot valve

**6** Thru **23** included in pilot valve model code



## Model code

DG4V	-	3	S	-	*	*(L)	2	**	-	*	-	(V)	M	-	*	*	*	*	(L)	-	*	H	5	-	60	-	(P*-A*-B*-T*)
1		2	3		4	5	6	7		8		9	10		11	12	13	14	15		16	17	18		19		20

### 1 Valve type

D - Directional control valve  
G - Subplate mounted  
4 - Solenoid operated  
V - Rated pressure (350 bar)

### 2 Interface

3 - ISO 4401-03, CETOP 3 (NFPA D03)

### 3 Standard performance

### 4 Spool types

2 - Closed center (all ports)  
6 - Closed center (P only)  
8 - Tandem center (open crossover)  
33 - Closed center (Bleed A & B)

### 5 Spool/spring arrangement

A - Spring offset, single solenoid  
AL - Spring offset, single solenoid (Left hand build)  
B - Spring centered, single solenoid  
BL - Spring centered, single solenoid (Left hand build)  
C - Spring centered

### 6 Soft shift valve

### 7 Soft shift orifice size

00 - No orifice  
07 - .7 mm  
08 - .8 mm  
09 - .9 mm

### 8 Manual override

Blank - Override in solenoid end only  
P2 - Manual override in end cap and solenoid, A & B models only

### 9 Solenoid energization identity

Blank - ANSI B93 energize solenoid A to give flow P to A  
V - Solenoid identification determined by position of solenoid (i.e. solenoid A is at port A end of valve, Solenoid B is at port B end of valve.)

### 10 Flag symbol

(Introduces electrical features and options)

### 11 Coil types

F - Flying lead type coils  
U - DIN 43650 coils  
SP1 - Single 1/4" male spade ISAE J858A type 1A  
SP2 - Dual 1/4" male spade ISAE J858A type 1A

### 12 Coil connectors

("U" type coils only, omit if not required)  
1 - Connector fitted  
6 - Connector with lights fitted  
11 - Rectifier with lights fitted  
12 - Rectifier fitted

### 13 Electrical connections

("F" type coils only, omit if not required)  
PA - Insta-plug male recpt. only  
PA3 - 3 pin receptacle  
PA5 - 5 pin receptacle  
PB - Insta-plug male & female recpt.  
T - Terminal block

### 14 Wiring housing thread

("F" type coils only, omit if not required)  
W - 1/2 NPT  
J - M20 x 1.5

### 15 Solenoid indicator lights

(Not available on PA, U, SP1, SP2, omit if not required)

### 16 Coil identification letter

G - 12V DC      DJ - 98V DC  
H - 24V DC      P - 110V DC

### 17 Soft shift coil identification

### 18 Tank pressure rating

5 - 100 bar (1450 psi)

### 19 Design number

### 20 Port orifices

e.g. "P08" - 0.8 mm orifice in P port (omit if not required)  
03 - 0.30 dia.      13 - 1.3 dia.  
06 - 0.60 dia.      15 - 1.5 dia.  
08 - 0.80 dia.      20 - 2.0 dia.  
10 - 1.0 dia.      23 - 2.3 dia.

## Orifice changing procedure

### WARNING

1. Before breaking a circuit connection make certain that power is off and system pressure has been released. Lower all vertical cylinders, discharge accumulators and block any load whose movement could generate pressure. Plug all removed units and cap all lines to prevent entry of dirt into the system.

2. Using a 5/32" hex key, remove manual actuator plug and spring from the end of solenoid (Tightening torque 6.2-7.3 N.m 55-65 lbf.in.)

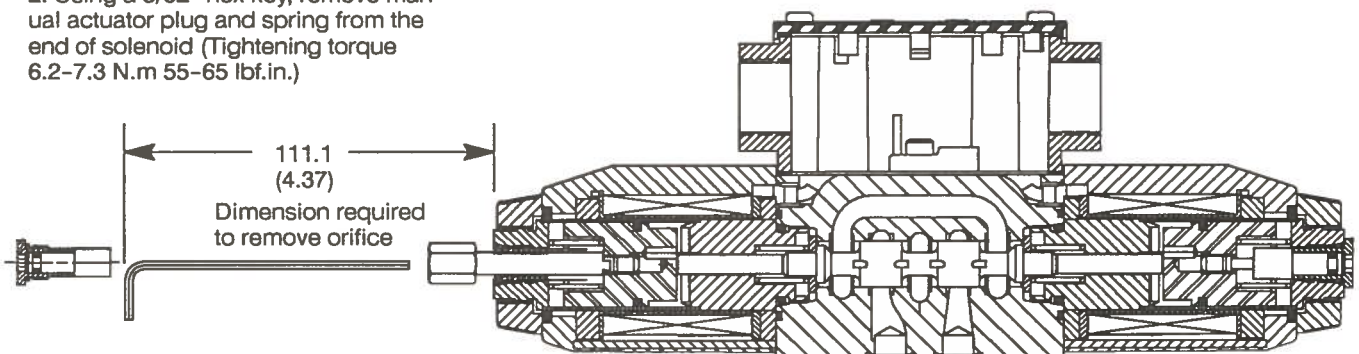
3. Insert extraction tool (878495) into solenoid via the manual actuator opening. Rotate tool until aligned and push pin into slot in armature.

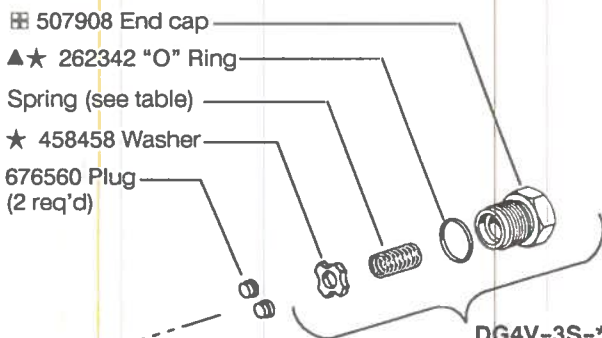
4. Using 1/2" wrench and tool to prevent the armature from rotating, insert 3/32" hex key down the center of tool and remove orifice plug.

5. Replace by the same method, tightening orifice snug to ensure bottoming of threads. Smaller orifices increase response times, larger orifices decrease response time.

### Orifice & tool kit 02-140211

For fine tuning shift performance, orifice must be ordered separately. The kit includes (2) each of .7, .8 & .9 mm dia. orifices, (1) installation tool, (1) 5/32" hex key and (1) 3/32" hex key.

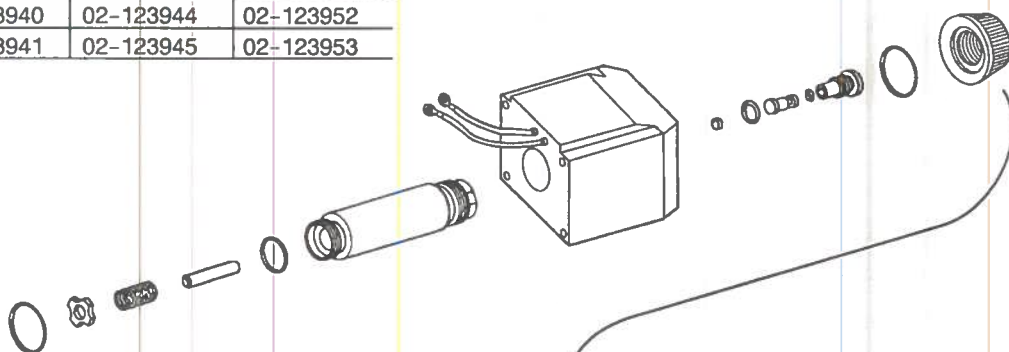




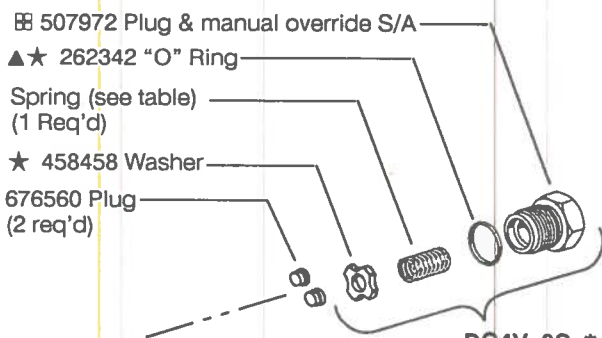
- ⊞ 507908 End cap
- ▲★ 262342 "O" Ring
- Spring (see table)
- ★ 458458 Washer
- 676560 Plug  
(2 req'd)

**DG4V-3S-\*A2\*\*(L)\*\*-(V)M-FW-60**  
 Spring offset to CYL. "A", shift to center  
**DG4V-3S-\*B2\*\*(L)\*\*-(V)M-FW-60**  
 Spring Centered, Sol. "A" Removed  
 Refer to other end of valve for common  
 part numbers except as noted.

COIL- LETTER	COIL S/A F MODELS	COIL S/A U MODELS	COIL S/A SP2 MODELS	COIL S/A SP1 MODELS
GH	02-123958	02-123938	02-123942	02-123950
HH	02-123959	02-123939	02-123943	02-123951
DJH	02-123960	02-123940	02-123944	02-123952
PH	02-123961	02-123941	02-123945	02-123953



**DG4V-3S-\*C2\*\*-(V)M-FW-60**  
 Spring Centered, Dual Solenoid  
 Refer to other end of valve for common  
 part numbers except as noted.



- ⊞ 507972 Plug & manual override S/A
- ▲★ 262342 "O" Ring
- Spring (see table)  
(1 Req'd)
- ★ 458458 Washer
- 676560 Plug  
(2 req'd)

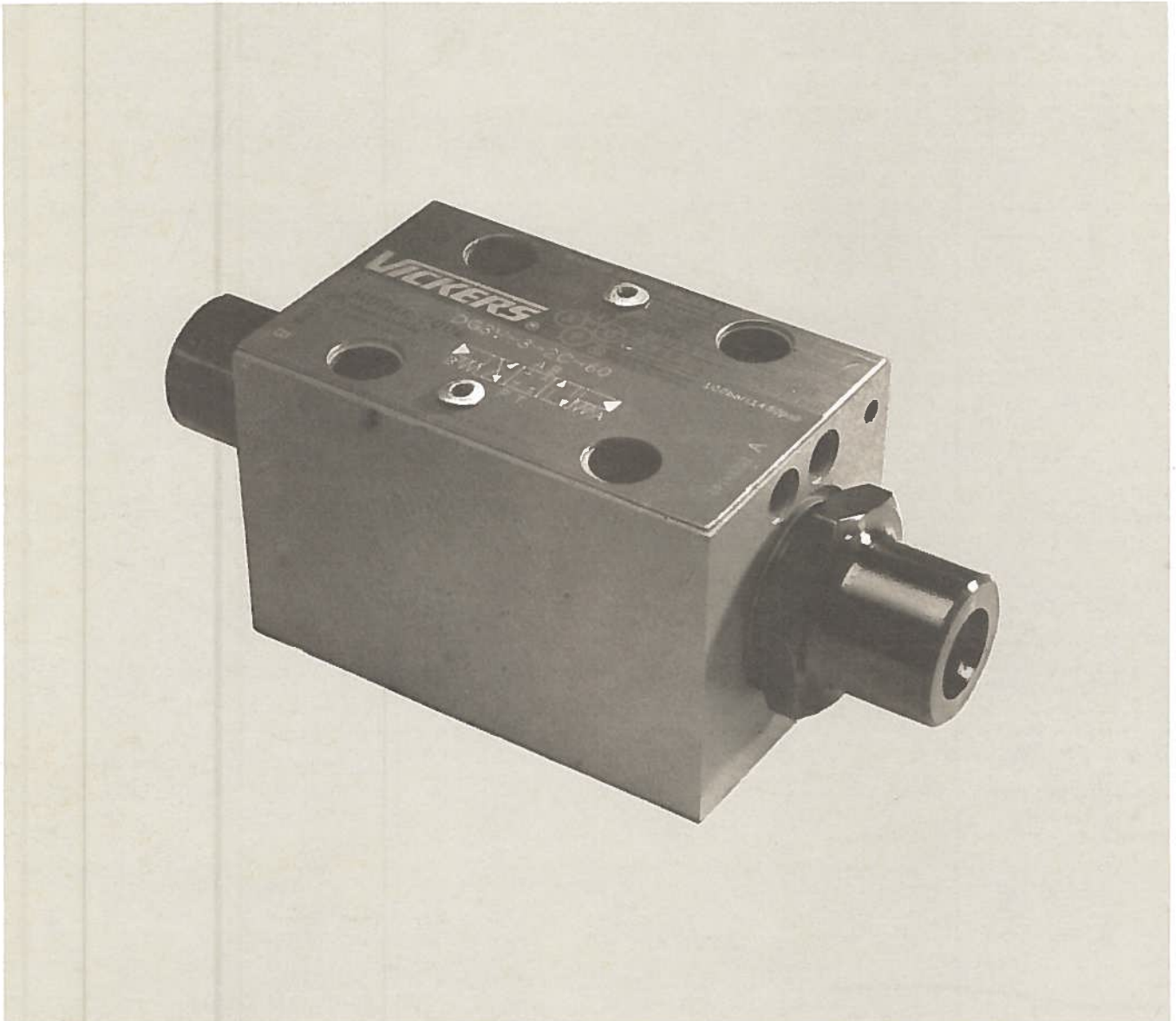
**DG4V-3S-\*A2\*\*-\*P2-(L)\*\*-(V)M-FW-60**  
 Manual override in end cap  
 Refer to other end of valve for common part  
 numbers except as noted.

**NOTE**  
 For satisfactory service life of these  
 components in industrial applications, use  
 full flow filtration to provide fluid which  
 meets ISO cleanliness code 18/15 or  
 cleaner. OFP, OFR, and OFRS series filters  
 are recommended.

**NOTE**  
 Right hand assembly shown for all single  
 solenoid valves; for left hand assembly all  
 parts are reversed except body.

# Hydraulically Operated Directional Control Valve

DG3V-3- \*\* \*(L)-(T)-(P1)-7-\* -60



Vickers Incorporated  
A TRINOVA Company  
5445 Corporate Drive  
P. O. Box 302  
Troy, Michigan 48007-0302  
U.S.A.



SPOOL/SPRING ARRANGEMENT	DRAIN TYPE	
	INTERNAL	EXTERNAL
	SPOOL NO.	SPOOL NO.
□ 0A	694537	694492
0B	694540	694435
0C	—	694435
0F	694540	—
0N	—	694494
□ 2A	694538	698839
2B	694541	698841
2C	—	698841
2F	694541	—
2N	—	698842
◆ 3B	694542	694436
◆ 3C	—	694436
◆ 3F	694542	—
□ 6A	694539	694493
6B	694543	694437
6C	—	694437
6F	694543	—
6N	—	694495
◇ 0	—	694492
◇ 2	—	698839
◇ 6	—	694493
33B	694544	694438
33C	—	694438
33F	694544	—

#### SPOOL ASSEMBLY NOTES

- Assemble spools with narrow end land towards A port end of body (Reverse for left hand builds)
- ◆ Assemble type 3 spool with narrow center land toward "A" port
- ◇ Blank - no spring required (refer to model code breakdown)

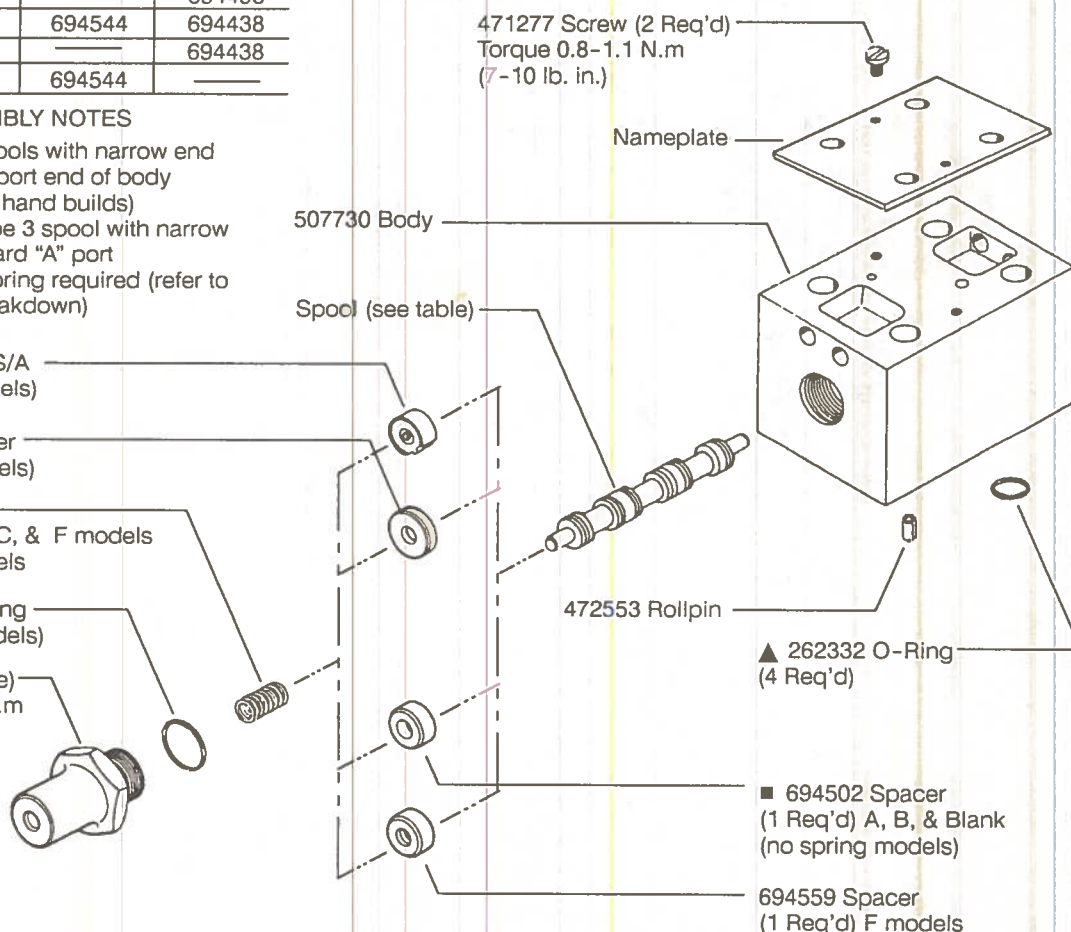
697386 Detent S/A  
(2 Req'd N models)

■ 694545 Spacer  
(2 Req'd C models)

507889 Spring  
(2 Req'd) A, B, C, & F models  
Omit for N models

▲ 262353 O-Ring  
(2 Req'd all models)

● Plug (see table)  
Torque 30-36 N.m  
(22-27 lb.ft.)



#### NOTE:

For satisfactory service life of these components in industrial applications, use full flow filtration to provide fluid which meets ISO cleanliness code 18/15 or cleaner. OFP, OFR, and OFRS series filters are recommended.

MODEL	● PLUG (qty.)
DG3V-3-**-7-B-60	694535 (2)
DG3V-3-**-7-S-60	694536 (2)
DG3V-3-**A-7-B-60	694535 (2)
DG3V-3-**A-7-S-60	694536 (2)
DG3V-3-**A-T-7-B-60	694535 (1)
DG3V-3-**A-T-7-S-60	694536 (1)
DG3V-3-**A-T-P1-7-B-60	694535 (1)
DG3V-3-**A-T-P1-7-S-60	694536 (1)
DG3V-3-**B-7-B-60	694536 (2)
DG3V-3-**B-7-S-60	694536 (2)
DG3V-3-**B-T-7-B-60	694535 (2)
DG3V-3-**B-T-7-S-60	694536 (2)
DG3V-3-**B-T-P1-7-B-60	694535 (1)
DG3V-3-**B-T-P1-7-S-60	694536 (1)
DG3V-3-**C-7-B-60	694535 (2)
DG3V-3-**C-7-S-60	694536 (2)
DG3V-3-**F-T-7-B-60	694535 (1)
DG3V-3-**F-T-7-S-60	694536 (1)
DG3V-3-**F-T-P1-7-B-60	694535 (1)
DG3V-3-**F-T-P1-7-S-60	694536 (1)
DG3V-3-**N-7-B-60	694505 (2)
DG3V-3-**N-7-S-60	694557 (2)

▲ Available in seal kit 02-110959

■ Recessed side of spacer to mate with spool end land

507724 End cap (Internal drain models)  
Torque 30-36 N.m (22-26 lb. ft.)

■ 694545 Spacer  
(A & B models)

694558 Spacer  
(F models)

694501 Plunger

■ 694545 Spacer  
(A, B, & C models)

694558 Spacer  
(F models)

694500 End cap  
Torque 30-36 N.m  
(22-26 lb. ft.)

▲ 262326 O-Ring

**Internal drain models**  
DG3V-3-\*\*-A-T-7-\*-60  
DG3V-3-\*\*-B-T-7-\*-60  
DG3V-3-\*\*-F-T-7-\*-60

Refer to other end of valve for balance of part numbers, except as noted

**External drain models**  
DG3V-3-\*\*-A-7-\*-60  
DG3V-3-\*\*-B-7-\*-60

Refer to other end of valve for balance of part numbers, except as noted

**External drain model**  
DG3V-3-\*\*-C-7-\*-60

Refer to other end of valve for balance of part numbers

**External drain model**  
DG3V-3-\*\*-N-7-\*-60

Refer to other end of valve for balance of part numbers

**External drain model (Blank no spring)**  
DG3V-3-\*\*-7-\*-60

Refer to other end of valve for balance of part numbers, except as noted

694559 Spacer (Use on Blank models only. Assemble next to spring with rounded face towards spool.)

**Manual override option (A, B, & F models only, in non-operator end)**

DG3V-3-\*\*-A-T-P1-7-\*-60  
DG3V-3-\*\*-B-T-P1-7-\*-60  
DG3V-3-\*\*-F-T-P1-7-\*-60

Refer to other end of valve for balance of part numbers, except as noted

#### VALVE ASSEMBLY NOTE:

Right hand assembly shown for all single operator models.

For left hand assembly all parts are reversed except body.

For left hand assembly, external drain B models all parts are reversed except body and spool.

## Model Code

<b>D</b>	<b>G</b>	<b>3</b>	<b>V</b>	<b>-3-</b>	<b>**</b>	<b>*</b>	<b>(L)</b>	<b>-</b>	<b>(T)</b>	<b>-</b>	<b>(P1)</b>	<b>-</b>	<b>7</b>	<b>-*</b>	<b>-</b>	<b>60</b>
1	2	3	4	5	6	7	8	9	10	11	12	13				

**1** Directional control valve

**2** Subplate/Manifold mounted

**3** Hydraulically operated

**4** Rated pressure

V - 350 bar (5000 psi) on P, A & B Ports

**5** Interface ISO 4401-AB-03-4-B

3 - NFPA D01, ISO 4401-03, Cetop 3 (with location pin)

**6** Spool type

0 - Open center (all ports) (all models)

2 - Closed center (all ports) (all models)

3 - Closed center (P & B ports) (B, C, F models only)

6 - Closed center (P port only) (all models)

33 - Closed center (bleed A & B ports) (B, C, F models only)

**7** Spool/Spring arrangement

Blank - No spring

A - Spring offset (Single operator)

B - Spring centered (Single operator)

C - Spring centered

F - Spring offset, shift to center

N - No-spring detented

**8** Left hand build

(Omit if not required)

L - Left hand build A, B & F models only

**9** Internal drain

(Omit if not required)

T - Internal drain, (required on F models available on A & B models)

**10** Manual override

(Omit if not required)

P1 - Manual override (A, B, & F models only in non-operator end) Internal drain only

**11** Tank pressure limit

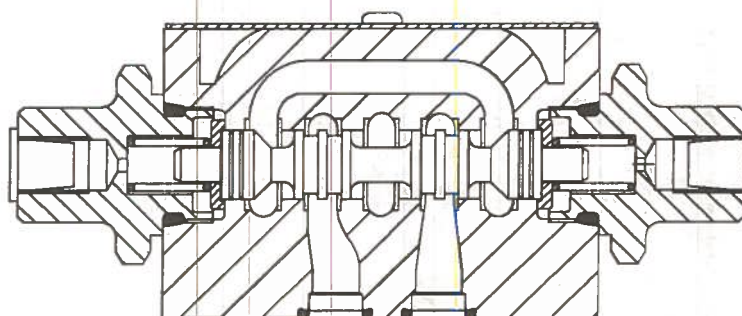
7 - 7 - 210 bar

**12** Thread for pilot/drain connection

B - G 1/8" threads

S - SAE internal straight thread

**13** Design



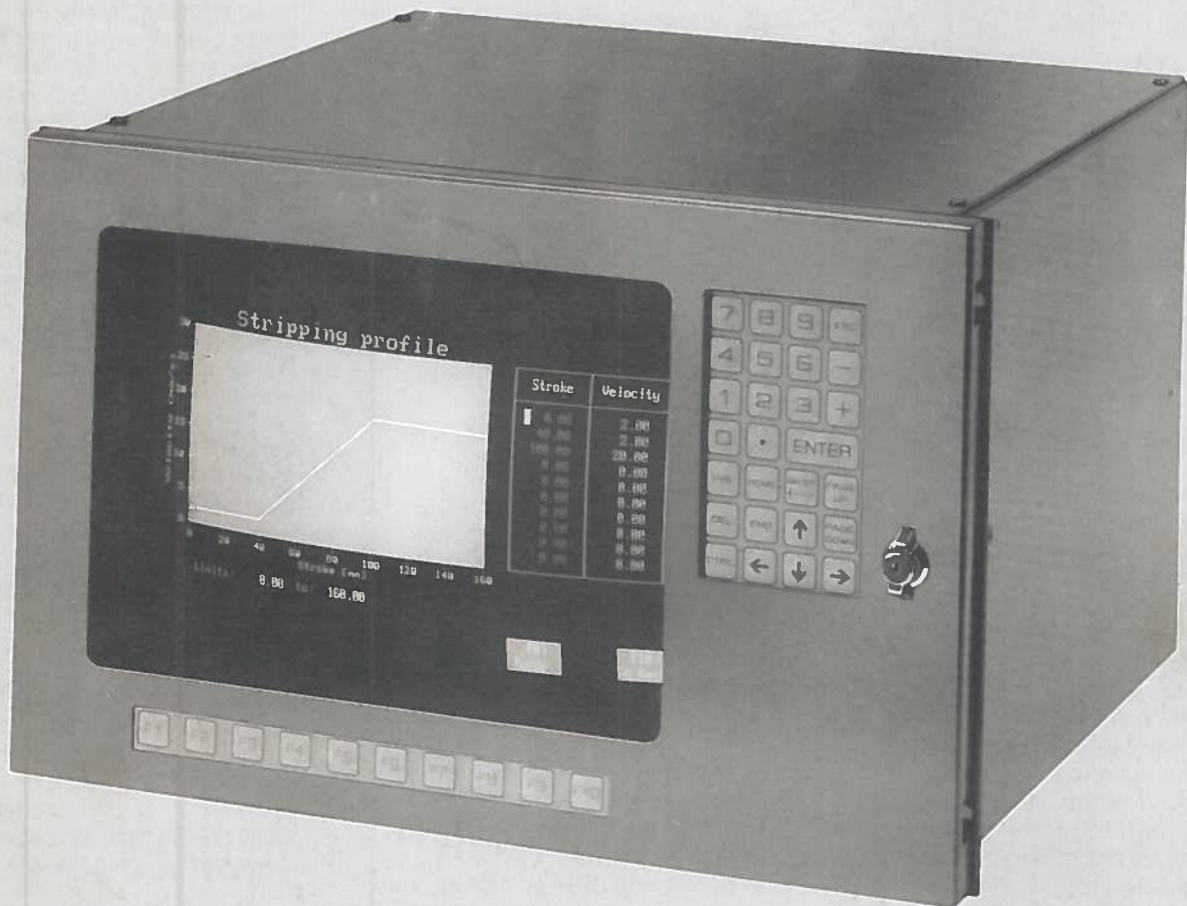
Sectional view, spring centered valve



**VICKERS**

# System 530, System 535

Modular Microcomputer Control Systems



## Data

Mains voltages . . . . 110/130/220/240V  
 +10%–15%, 50/60 Hz  
 Protection . . . . . IP54  
 . . . . . per IEC 529/DIN 50040  
 Ambient temperature . . . . 0 bis +50 °C  
 Dimensions per DIN 41494, 19" format:  
 Operator's panel:  
 482.6 x 310.3 x 460 mm (19 inch)  
 Card magazine: . . 482.6 x 400 x 315 mm

## 1. General description

The 53X range of microcomputer control systems has been designed to provide a high degree of electromagnetic compatibility using the very latest components, and complies with current regulations of ensuring complete protection from radiated interference. Each system in the range comprises an operator unit and a control unit which can be combined to meet a wide variety of requirements. In addition to its all-purpose capability, this microcomputer controller constitutes the optimum solution for process automation. Peripheral units of the system are specially designed for driving and controlling plant and machinery equipped with hydraulic or electric servo drives. The outstanding control performance is achieved by the Vickers multitasking system with dynamic allocation of computing power to as many as 9 individually and simultaneously operating tasks. Software modules are available for a variety of system solutions. The sys-

Product Advantages	Practical benefits
<ul style="list-style-type: none"> <li>- State-of-the-art microcomputer technology used to optimum effect</li> <li>- EMI and RFI protection</li> <li>- Efficient real-time multitasking system. Dynamic mapping of computer space</li> <li>- Modular design</li> <li>- Ample computing power</li> <li>- Ergonomically designed operator station with separate function keys, numerical input field and special function keys</li> <li>- Easily understood programming languages: MS Quick BASIC augmented by the "Vickers IO-LIB" command library and LOGIC for program sequences (similar to PC) and for numerical functions</li> <li>- Integrated fault finding aids</li> <li>- Field-proven software packages for various types of machines</li> <li>- Separate memories for machine data allow programs to be easily adapted to the different sizes within a machine product range</li> <li>- Comprehensive quality control function using processing and quality data stored in memory. Fault diagnosis in plain text. Print-out of machine and process data (off-line printer)</li> <li>- Internal and external data memory and data transfer.</li> </ul>	<ul style="list-style-type: none"> <li>- Ideal for controlling complex machinery</li> <li>- Reliable, even under the most hostile operating conditions</li> <li>- Rapid reaction for switching tasks such as changing from injection pressure to hold pressure or multi-axis control algorithms</li> <li>- The cost-effective answer to many different applications and requirements</li> <li>- Problem-free processing of complex control algorithms</li> <li>- Simple and clear operation</li> <li>- User-friendly, informative displays with setpoint value and actual value graphics. Checkout of screen masks even during programming</li> <li>- Shorter machine start-up times</li> <li>- Simple to modify. No reconstruction of entire programs</li> <li>- Shorter development times for complete ranges of machines</li> <li>- Increases productivity, quality and reliability. Supplies hardcopy data to support quality objectives</li> <li>- Quick and easy generation of new production parameters</li> </ul>

tem software (firmware) provides a convenient means of writing user programs. The extremely attractive price-performance ratio of the 53X system makes it the ideal controller for injection moulding machines, die casting machines, blow moulding machines, SMC/GMT presses, etc.

## 2. System structure

"System 530/535" is a modular system readily adaptable to any machine configuration. Its mechanical design is in accordance with DIN 41494 (19" technology, double Eurocard format). The main units are:

- Operator's panel (Fig. 1)
- Card magazine (Fig. 2)

### 2.1. Operator's panel

- Industry standard PC-AT
- Membrane keyboard with key fields installed in protective door with window for screen: 10 softkey functions below the screen window, numeric key field with cursor and control functions.
- The door hinges open to reveal: 14" color monitor, two 3.5" floppy disk drives, printer connection, connector for editing keyboard (service), reset key. The assembled operator's panel conforms to IP54 (IEC 529 / DIN 40050).

### OEM version

Special versions e.g. with flat screen and/or lower-cost processor combined with the manual machine switches are also available by arrangement with Vickers.

### 2.2 Card magazine

The system components are installed in a 19" rack (6 or 9 units height) vertical modules high with a further 4 mounting slots each 3 VM high for valve booster cards. Standard equipment configuration for the card magazine is:

- **Power supply for central processor:** Mains voltages of 110/220 or 240V AC selectable using a rotary switch; built-in interference filter and power failure monitoring system with emergency switch-off. Control LEDs and all test outputs arranged on front panel.
- **Central processor:** Based on 68 B 09 CPU, 16k RAM – battery-backed, 16k system EPROM, one 32k EPROM program memory, 16k EPROM program memory, two RS 232 C interfaces, status display on front panel. Equipped with RS 485, TTL or fibre optics on request. Different operating systems for System 530 and System 535.

### 3. System performance

	System 530	System 535
Digital in/out	64 out/96 in	96 out/144 in
Analog in	2	32
Analog out	4	16
Position measurement	4	12
Speed sensing	1	0
Temperature sensing	6	
Heater: PWM outputs	8	16*)

\*) with optional thermocouple signal conditions

### 4. Accessories

#### Cabling

Made-to-measure, pre-mounted cables can be supplied on request.

### 5. Operation

The ergonomically designed operator's panel ensures simple and straightforward system operation from an industrial keyboard. Type IP 54 protection is provided by the membrane keyboard design (which gives the operator a positive mechanical effect). The keys have been limited to an easily-usable number and divided into blocks.

- Softkeys  
These are keys assigned to symbols or headings displayed on the screen. The main machine functions are called up from the first screen page. Once these functions are invoked, some of the softkeys are allocated to other functions in order to proceed farther into the input structure. In addition, pop-up menus can also be called up via function keys, e.g. for storing data or invoking the setup parameter sets.
- Numeric, cursor and control keys  
These keys are concentrated in a block. The cursor keys are used for skipping the setpoint value input positions. In addition to the numeric keys, the following control keys are provided:

"INS"	Edit input fields
"DEL"	Delete character during editing
"BACKSP"	Go into editing mode and delete the character to the left of the cursor
"CRT"	Currently not used
"HOME", "END"	In input mode, move cursor to first or last input field. In editing mode, to the start or end of the input field.
"PgUP", "PgDn"	Count up or down specified input strings, numbers or letters. Used for simple entry of selections (e.g. ON, OFF, STOP), setpoints (e.g. 0...75) or writing text without using the alphanumeric keyboard.
"ENTER"	Terminate an input or go to next input field on termination
"CURSOR" keys	In input mode, move from input field to input field in direction of arrow. In editing mode, "left", "right" moves cursor within field, "up", "down" terminates editing and moves cursor into next higher or lower input field.

### 6. Writing application programs

System 530/535 uses an input/output processor and a central processor. Since specific tasks are allocated to the two processors, it is necessary to use two appropriately optimized programming languages.

#### 6.1 I/O processor

This processor has the task of presenting the user with the machine procedures in such a way that he can interrogate or input all his important parameters. These parameters must be displayable in each unit required, irrespective of the unit with which the central processor is operating. This also includes the inputting and outputting of profiles. The ideal language was found to be 'MS Quick BASIC', augmented by the 'Vickers IO-LIB' command library. This library extension to original Quick BASIC offers a simple means of creating user-friendly screen masks in text or graphics. The appropriate commands are available for defining input and output value fields. Predefined windows can be

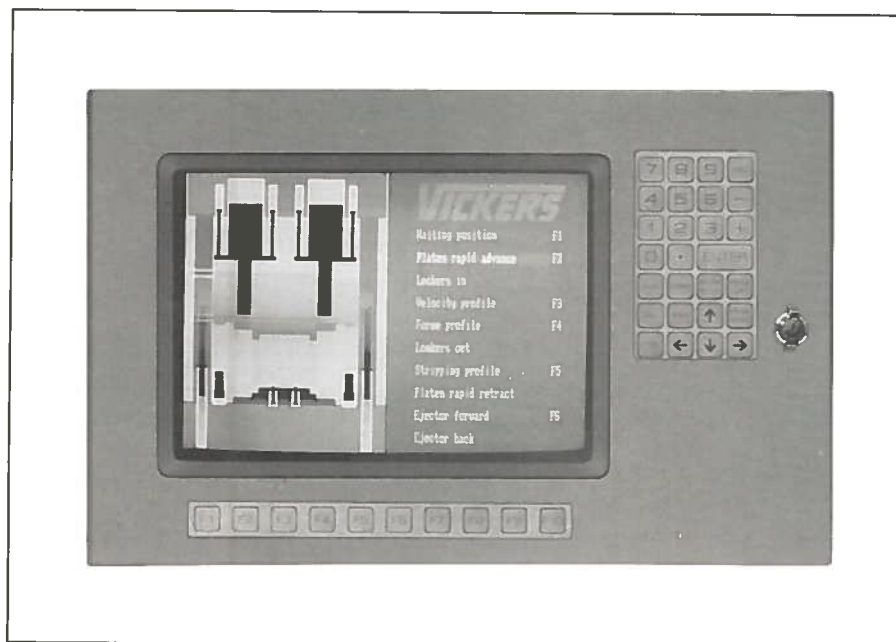


Fig. 5 – Operator's panel on an injection moulding machine



easily used. Structures implemented in firmware allow comprehensive user instructions and help texts to be incorporated.

The applications programmer is additionally relieved of the task of communications programming, as this is also part of 'Vickers IO-LIB'. This extended programming language allows the screen pages to be checked out individually during development thanks to the integrated interpreter mode, and the whole application is finally compiled into a program. As it is possible to import external programs, this also opens up the enormous range of generally available (MS-DOS) PC-based programs for tasks such as statistic process control (SPC), expert systems, networking with host computers etc. and much more besides.

## 6.2 The "LOGIC" programming language

When System 53X was developed, it was considered to be particularly important that the entire machine – injection moulding machine or press – should be controlled by a central processor without an additional programmable controller.

LOGIC is the language for programming sequences and control algorithms. It is comparable to the programmable control languages of other control systems but has been extended to include the analog or numerical part of programming. Using the specially developed Vickers VMTX multitasking system, "LOGIC" can be used to structure programmes so that parallel sequences and complex controls with a very rapid sampling time can be implemented.

Nowadays the number of numerical functions is continually growing due to the increasing complexity of applications and machines.

In System 53X, therefore, sequence programming and the numerical section – i.e. the programming of controls – has been covered by one programming language (LOGIC) and one all-in software package.

However, LOGIC also enables C-routines to be invoked or linked in. These are stored in an EPROM area.

## 6.3 Development tools

Both the control processor and the central processor can be programmed using an industry standard PC. As the control processor is PC-based, it can be used during service operations both for diagnostics and troubleshooting on the central processor by means of an additional editing keyboard and for correcting application programs not only on the

central processor but also on the control processor. Troubleshooting is supported by the following firmware modules incorporated in system 5\*\*:

- LOADER/EDITOR for the logic programs allows programs to be edited and loaded into the system memory, with the ASCII mnemonics automatically converted into machine code.
- SETUP is the name of the debugger at applications level, allowing access to global integer variables, markers and timer registers during program execution. Also included are all the actual and setpoint values sent to and

from the control processor. In addition, the execution path can be analyzed in the active LOGIC program and diagnostic messages initiated.

- IOTEST. This program contains general I/O tests and display functions for the programmer and applications engineer. They are particularly useful as commissioning (start-up) checking for the wiring and correct operation of the peripherals. All these tests are also possible (with due care) during operation.
- EXTEST. This program contains extended test functions for checking

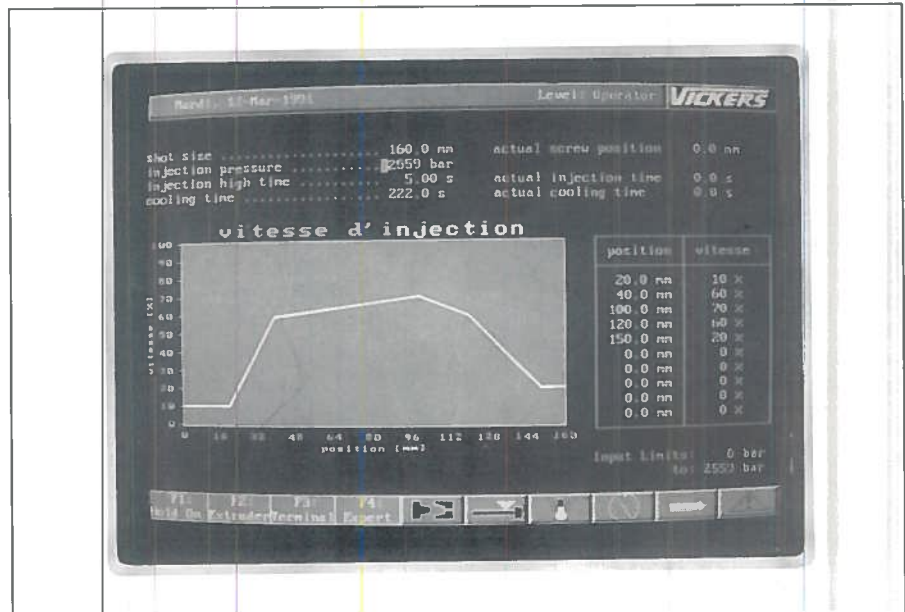


Fig. 6 – Injection Molding Machine – Input of set values and injection velocity profile. Display of actual values.

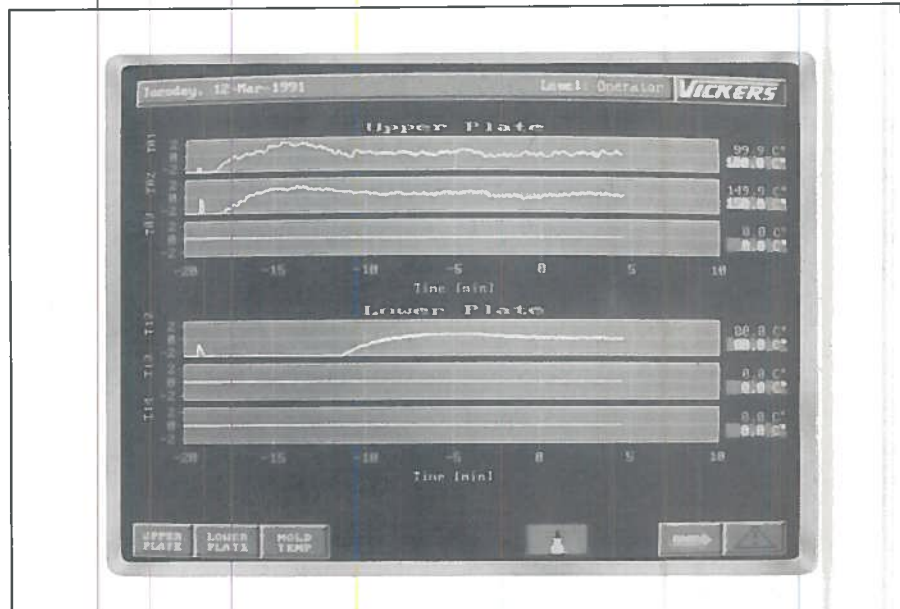


Fig. 7 – SMC-Press – Actual mold temperature profiles, displayed as temperature deviation vs. time graphics.

On request, depending on control requirements:

**1 to 3 digital input/output cards:**

48 digital inputs, 24 V, and 32 digital outputs, 24 V/500 mA with overload protection. The inputs have a debouncing circuit and are protected against surges. If permissible voltages are exceeded, an error message appears on the screen and a red LED alarm is activated on the front panel. Maximum configuration: System 530: two interface cards; System 535: three interface cards.

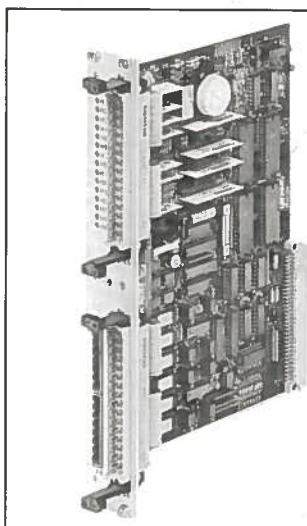


Fig. 3 – Digital input/output card

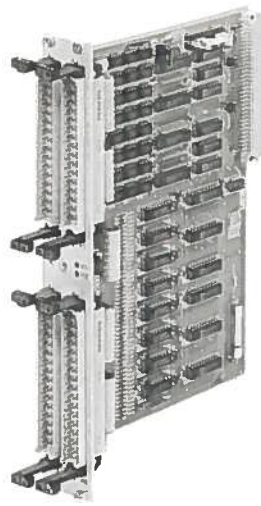


Fig. 4 – Process interface card

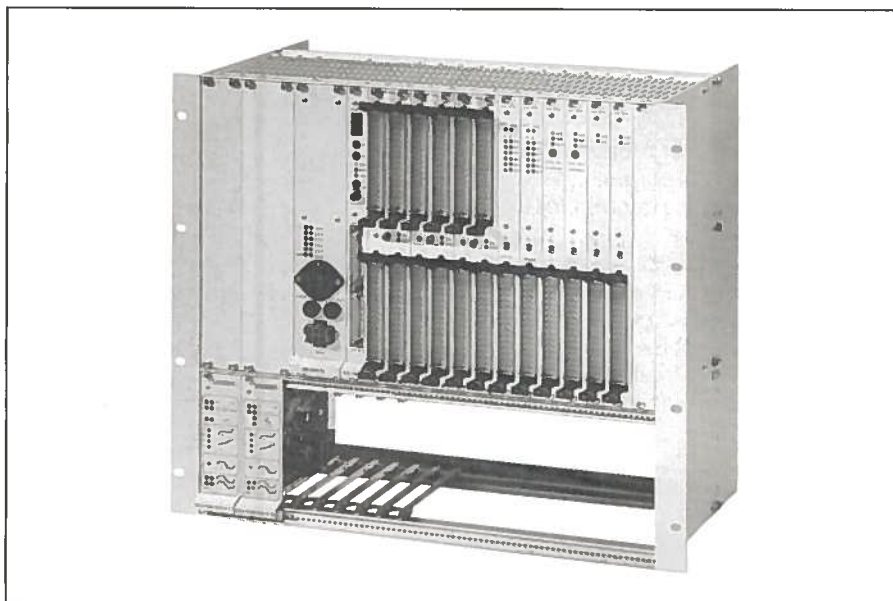


Fig. 2 – System card magazine

**One process interface card**

(System 530 only):

- 4 x 16 bit incremental linear position encoder, battery-backed
- 1 x shaft encoder interface
- 6 x temperature channels for FeCu-Ni thermocouple inputs with 10 bit resolution
- 2 x analog inputs – 0-10 V or 4-20 mA, 10 bit resolution, open-circuit monitoring by alarm display on the screen
- 4 x analog outputs – 4-20 mA, 0-10 V or  $\pm 10$  V, 8 bit resolution with programmable ramp generators
- 8 x 24V/500 mA digital outputs with adjustable pulse-width modulation and overload protection. Overload also indicated by an error message.

**1 to 2 analog input cards**

(System 535 only): 16 rapid-conversion analog inputs – 0-10V or 4-20 mA, power input with transducer failure monitoring system, 12 bit resolution. All input channels have 2nd order low-pass filters and are protected against overload. Watchdog circuit for stoppage monitoring. Maximum configuration: two cards.

**1 to 2 analog output cards**

(System 535 only): 8 channels, 0-10 V or 4-20 mA, 12 bit resolution, protected against surges and short circuit, with low-pass output filters. Watchdog circuit for system fail monitoring. Output driver with high impedance range. Maximum configuration: two cards.

**1 to 2 Incremental Encoder Interfaces**

(System 535 only): 6 channels with 16 bit resolution. With a reduced number of outputs, 32 bit resolution is possible. Can be coupled to incremental position encoders from most manufacturers (TTL open collector or RS 422 signals) and, if required, absolute position encoders ultra position encoders. Power supply for position encoders from the control system. Maximum configuration: two cards.



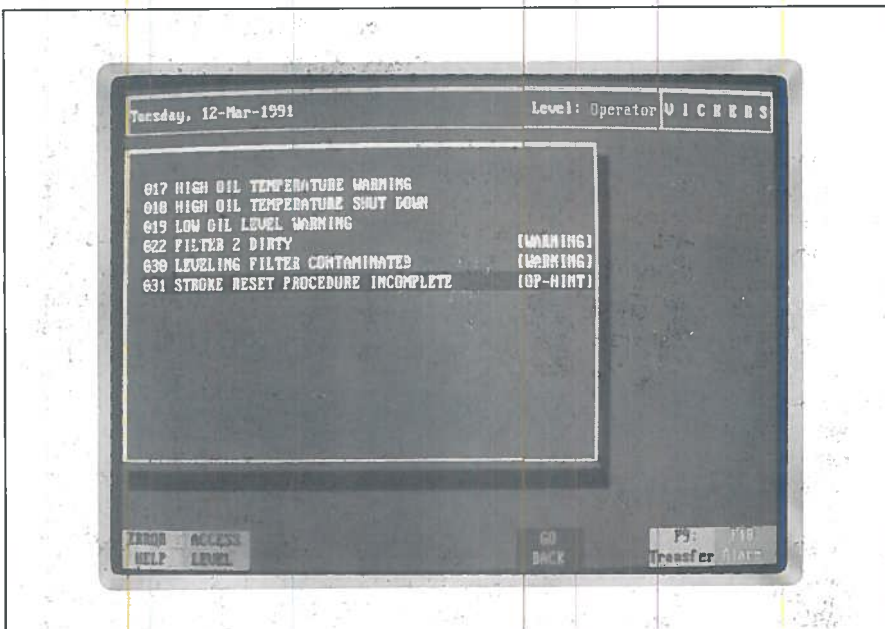


Fig. 8 – SMC/GMT Press –  
Error display. On-line help text and operating instructions can be displayed  
on a cursor-selected topic.

the peripheral hardware. Some of these functions may also be useful in the field, while others can only be used in conjunction with test equipment.

– **DEBUG.** This function allows the programmer access both to memory locations and to CPU registers. Once again, the operation of the multitasking system can be observed and influenced. Due to the virtually unlimited access to internal system structures, this debugger should only be used by advanced programmers.

For the applications programmer, a special CPU with battery-backed RAM is available, as well as an EPROM programming unit. The following auxiliary PC programs for the applications programmer are additionally available:

- Program editor for creating the LOGIC source program.
- Communications program for up- and downloading.
- C cross-compiler for writing Toolbox routines.
- IOLIB. The Vickers command library for MS Quick BASIC. The MS Quick BASIC Compiler is commercially available in the relevant national language.

All these tools are part of a logically organized structure allowing several application programs to be easily handled.

#### 6.4 Support Literature

- Programming manual for initial set-up, to program or modify sample applications
- Description of system components – these are explained in detail on individual data sheets
- Operating manual with description of use on an injection moulding machine.

Presented by:

**VICKERS**  
A TRINOVA Company





## “Soft switch” powerplugs

**EHH-AMP-702-C-10**

**EHH-AMP-702-F-10**

### 1. General description

These plugs, conforming to ISO 4400/ DIN 43650 interface, offer adjustable, ramped on/off switching times through the use of an integral amplifier.

Two switching times ranges are available:  
 – model type C, 10 – 600 ms  
 – model type F, 0,5 – 5s

The soft switch plug is rated for 24V DC nominal and controlled by a 24V logic signal. Applying an “on” signal causes the output current to ramp up to, and to stay at, an adjustable maximum while the “on” signal is maintained. At “switch-off” the output current is ramped down to zero, and will remain at zero until the next “on” signal.

Ramp times (i.e. switching times) can be adjusted by in-built potentiometers.

An adjustment also allows for compensation of any deadband in the load.

### 2. Features and benefits

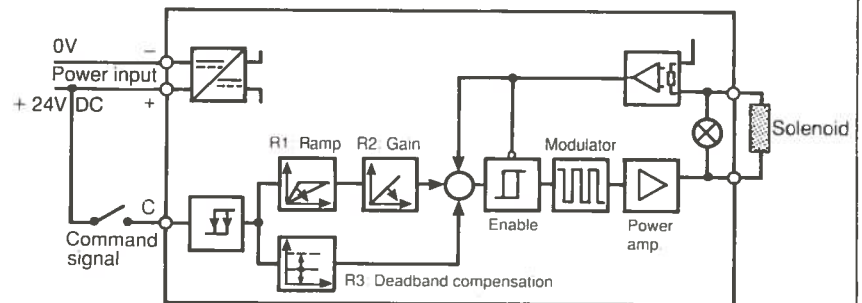
- Integral amplifier provides control from on/off logic command signal
- Adjustable ramp time
- Deadband compensation
- Adjustable output level
- Improved switching time repeatability
- Reduction of EMI radiation
- Fully short-circuit and reverse-polarity protected

### 3. Application

Focus applications for this plug are in the control of hydraulic solenoid operated directional and pressure control valves where control of valve response time can significantly reduce shocks in the hydraulic system.

Best results in reducing hydraulic shocks will only be obtained by using valves with the right “low shock”, or “proportional” features.

Electrical block function diagram



### 4. Model code

**EHH-AMP-702- \* - 1\***

1 2

#### 1 Adjustment range

C = Soft switch power plug: 10 ms to 600 ms

F = Soft switch power plug: 0,5s to 5s

#### 2 Design number, 10 series

Subject to change: installation dimensions unaltered for design numbers 10 to 19 inclusive.

## 5. Operating data

### 5.1 Electrical

Power supply	20 – 28V DC: incl. $\pm 10\%$ max. ripple peak-to-peak
Protection	IEC 529; IP65 (when correctly installed with interface seal in place) Fully short-circuit and reverse- polarity protected
Isolation to VDE 0110	Group "B"
Output current: rated cut-off short-circuit	1,6A 3A 0,1A rms typical
Max. load impedance	12 ohms
Output voltage	Typically 0,5V below input voltage
Command signal for "on" for "off"	$\geq 13V \leq 32V$ $\leq 5V$
Input impedance (signal)	2700 ohms
PWM frequency	400 Hz typical
Ramp time: model type C model type F	10 ms to 600 ms 0,5s to 5s
Output range	0,5A to 1,8A
Deadband compensation	0 to 1A

### 5.2 Mechanical

Housing	PA6 glass reinforced plastic (conforming to UL-94HB) Color: gray
Mounting interface	ISO 4400 (DIN 43650)
Cable clamp	Pg9 screw type
Cable diameter	Ø5-10 mm (0.197-0.394" dia)
Wire section	0,5-1,0 mm <sup>2</sup> (0.001-0.002 in <sup>2</sup> ) (20AWG-18AWG)
Temperature, ambient range	-20 to +70°C (-4 to +158°F)
Mass	0,07 kg (0.154 lb)

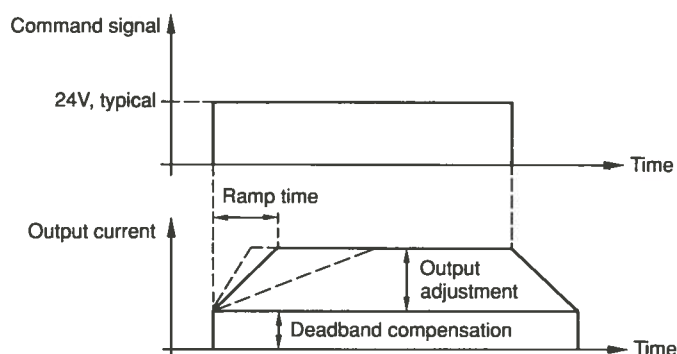
### 5.3 Functions

● Switch-on/off: after switching on with a 13V signal the amplifier will remain in the "on" condition with a command signal above 6V. The command signal must be reduced to below 5V to achieve switch-off of the amplifier.

● Adjustments:

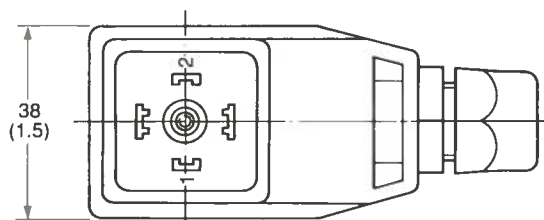
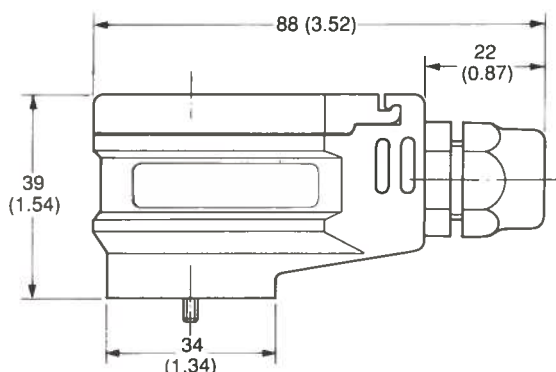
- Ramp  
Ramp time is adjustable by potentiometer R1
- Output  
Maximum output current is adjustable by potentiometer R2
- Deadband compensation  
Deadband compensation is adjustable by potentiometer R3

### Input/output characteristic



### 6. Installation dimensions in mm (inches)

3rd angle projection



### 7. Installation data

#### Commissioning (start-up) procedure

1. Correctly wire the plug and, before mounting it on the valve solenoid, apply 24V DC (20 to 28V limits) to the "power input" terminal.
2. Check for correct plug function by illumination/non-illumination of the LED:
  - a. Apply less than 2 to 3 volts to the input terminal: the LED should not be illuminated.
  - b. Increase voltage: the LED should illuminate when the voltage reaches 13V. *Do not exceed 32V command signal.*
  - c. Decrease voltage: the LED should go off when the voltage is less than 5V.

If there is a malfunction a new plug must be fitted.

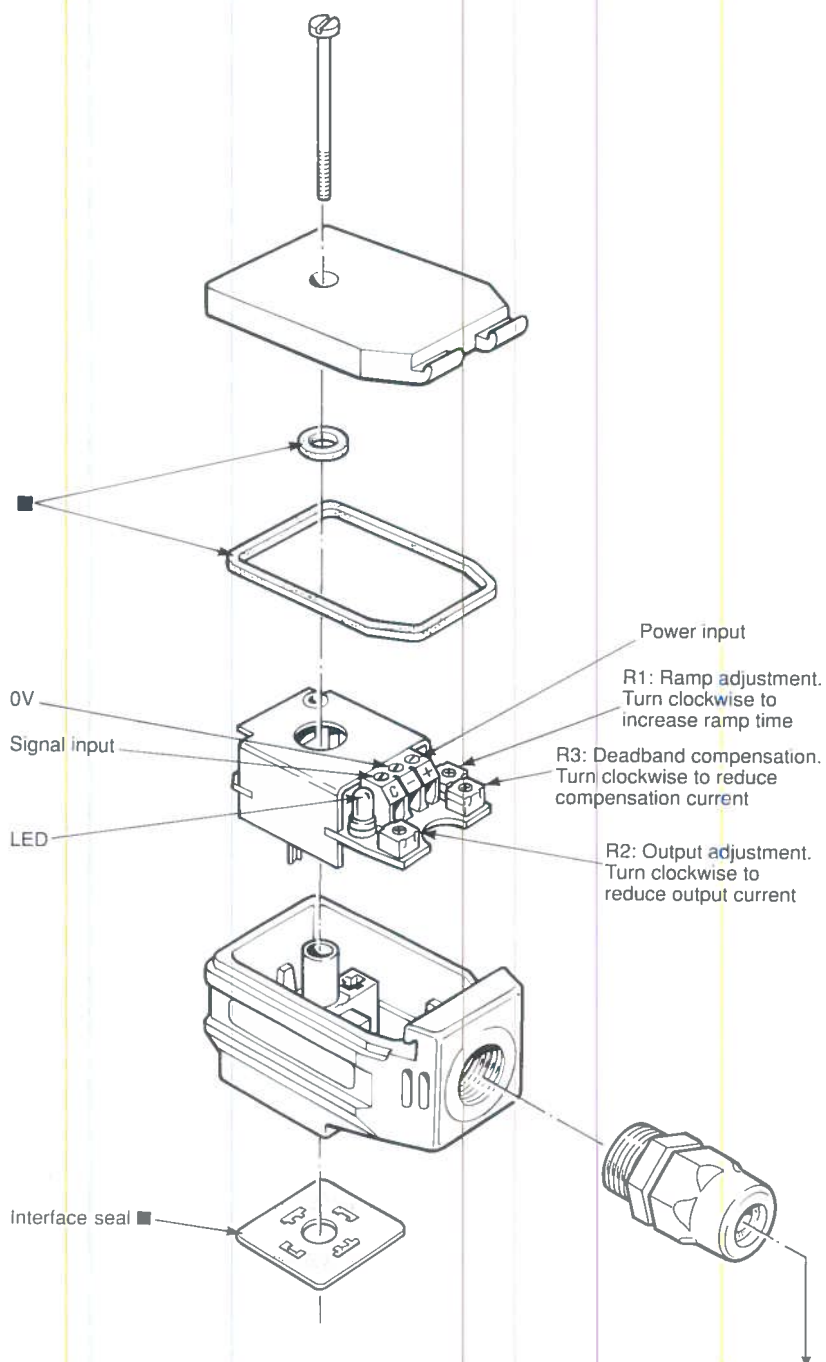
3. Switch off power supply and command/input signal and then install plug on solenoid. Ensure that all seals are fitted correctly and clamped as the retaining bolt is tightened: *this is essential in providing IP65 protection.*

4. Ensure that the hydraulic system will not cause any unsafe movement of actuators, then:
  - Switch on power supply again.
  - Repeat LED/function check as in 2.
 An LED malfunction now indicates a short circuit at the load.

5. Successful completion of these checks means that the plug and load are ready for use.



Assembly showing wiring connection points, LED and adjustment potentiometers

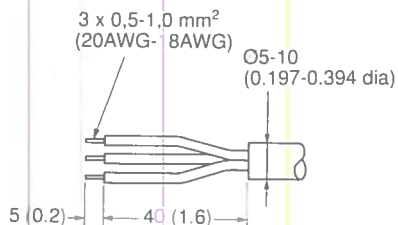


#### Warnings

- Ensure cable clamp nut is adequately tightened to secure the cable
- Do not install, or remove, the plug when power is on
- Do not connect, or disconnect, the wiring while power is on

■ All seals must be fitted correctly at plug installation to provide protection to IP65 (IEC 529)

#### Wiring preparation



#### 8. Spare parts

The only spare part available is the interface seal, part number 732100.

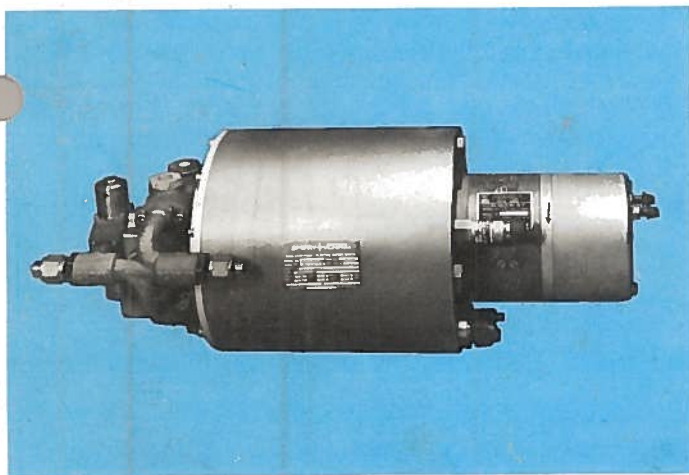
#### 9. Ordering procedure

Order plug by full model code, and spare interface seal by part number 732100.

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## HYDRAULIC POWER PACK FOR BEECHCRAFT'S 1900 AIRLINER



The PPEV3-011-12A integrated electrohydraulic power package was developed for Beechcraft's new generation commuter airliner. The aircraft's designers emphasized ease of maintenance, reduced ground time and top efficiency to meet the challenges of today's commuter aviation industry. The Vickers power pack provides an efficient source of hydraulic power for landing gear actuation in a compact, reliable package.

The PPEV3-011-12A power package is a DC electric motor-driven hydraulic power supply that contains all the essential components of an entire hydraulic system built into a single unit.

Major subassemblies include:

- Valve manifold
- Inner reservoir
- Outer reservoir
- Pump
- Return filter
- Landing gear selector valve
- Electric motor

Combining these components into a single, unitized package offers several advantages over a comparable system made up of separate components. An integrated power pack eliminates the need for several external lines. By integrating control pressure lines into the manifold, flow paths are shortened and there are fewer external connections. This arrangement reduces the number of potential leak points and increases the unit's overall efficiency and reliability. It also results in a significant weight savings: the entire package weighs only 33 lbs.

Another advantage of the Vickers integrated power package is the maintainability of the design. Unitized construction greatly facilitates the speed and ease of repair and replacement. The entire package can be removed by disconnecting four hydraulic connections, four electrical connections and six mounting bolts. The electric motor subassembly can be removed and replaced without disturbing any hydraulic seals or connections.

The pump subassembly is based on Vickers military specification qualified 0.11 cu. in./rev. variable-displacement inline pump. The basic 0.11 design has proven its reliability in years of service in a variety of applications. These features give the Vickers PPEV3-011-12A integrated hydraulic power package a high maintainability rating and it greatly enhances the Beech 1900's response to on-time dispatch.

Vickers has over 40 years experience in aerospace hydraulic and electrohydraulic fluid power. This includes integrated power pack applications for the Minuteman missile, F-4 Phantom, F-14 Tomcat, Phoenix missile and others.

## ELECTRIC MOTOR

The PPEV3-011-12A uses an air-cooled, compound-field, four-pole, series-wound, 28VDC, 7200 rpm, synchronous-speed electric motor. It is indexed and piloted on the pump mounting flange and is attached by thru-bolts. The motor, which generates 4.2 intermittent horsepower and 1.0 continuous horsepower, converts aircraft electrical system power into rotary shaft power to drive the hydraulic pumping unit. The motor is designed to provide short-term continuous operation at low horsepower demands. This occurs during aircraft taxi and provides nosewheel steering.

The electric motor incorporates an internal fan with vents in the brush cover and motor frame to facilitate cooler operation. Additionally, the motor materials ensure rapid heat transfer. Other design features include oversized armature laminations to reduce current density. Altitude-treated brushes ensure extended brush life. Riveted and silver-soldered shunts improve conductivity, heat transfer and motor efficiency. Windings and insulation are rated at 220 degrees centigrade according to N.E.M.A. class H standards. Bearings are permanently sealed to reduce maintenance and downtime. And, motor cooling vents incorporate flame arrestors and the motor conforms to MIL-E-5272C specifications.

## PUMP SUBASSEMBLY

The hydraulic pump is our proven 0.11 cu. in./rev. variable displacement, pressure compensated, inline pump. The seven-piston design produces up to 3.2 gpm flow at 7200 rpm at a pressure of 1500 psi. The pumping unit is designed to operate in a 3000 psi system.

Control of the pressure and flow relationship is accomplished by utilizing dual-actuating control pistons to overcome the force of the control springs that vary the displacement of the pumping unit. This produces a constant horsepower pump operating between the 1500 psi and 3000 psi system pressures.

The pressure compensator is a spring-biased, three-way valve. When system pressure reaches a preset value, the valve moves and regulates the control pressure acting on the actuating piston.

The maximum outlet pressure is adjustable within the range of the compensator spring which is normally plus or minus ten percent of the nominal value of the spring.

## MANIFOLD

The manifold subassembly consists of a manifold casting with the necessary filter and valve installation cavities, and internal connecting lines and porting. All HPP valves are housed within this assembly, except for the thermal relief valve which is contained in the reservoir subassembly. The manifold subassembly also functions as a mounting base for one end of the inner and outer reservoir shells.

## RESERVOIRS

The dual-capacity 230 cu. in. reservoir provides primary and emergency fluid volumes for the landing gear actuation system. In the event the inner, primary, reservoir becomes completely drained, fluid in the outer emergency reservoir is retained for use in a hand-operated pump which permits emergency extension or retraction of the landing gear. The emergency fluid volume cannot be depleted by the main pumping unit, thereby providing a fail-safe capability to the landing gear system.

## VALVES

The Vickers integrated power pack contains all valves necessary for safe system operation.

- Solenoid-Operated Selector Valve -- The landing gear is controlled by a three-position, four-way selector valve.
- Pressure Switch -- This switch maintains pressure in the gear-up mode. When system pressure decreases below 2600 psi, the switch signals the power pack for a pressure increase up to the 3000 psi range.
- Thermal Relief Valve -- This valve provides pressure relief for the system during extreme temperature transients.
- Hydraulic Fuse -- This valve removes pressure from landing gear locks to allow gear-up operation.